

STEAM  
POWER  
PLANTS  
OF THE  
PACIFIC  
COAST











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# STEAM POWER PLANTS OF THE PACIFIC COAST

FURNISHED BY  
**CHAS. C. MOORE & CO**  
**ENGINEERS**

MAIN OFFICE  
**63 FIRST ST.**  
**SAN FRANCISCO, CAL.**

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**NEW YORK**  
1303 Havemeyer Bldg  
**SALT LAKE CITY**  
511-512 Scott - Strevell Bldg

*The execution of an entire  
contract from start to finish  
under one management in-  
sures the best results. ♪ ♪*



## INTRODUCTION.



The following pages partially illustrate and describe some of the work we have done in the past few years on the Pacific Coast and the Hawaiian Islands.

We started in business in the Spring of 1895, fortified with the conviction that there was room on this Coast for a designing and constructing engineering concern, making a specialty of work of the highest grade only. This policy has been maintained, and despite the temptation offered to increase the volume of sales and secure larger profits by handling cheaper lines of apparatus, we have stuck to our policy that "the best is none too good," and that we should at all times be in position to offer machinery that should properly be the first choice of the engineer. We have felt we could afford to lose business on price, but under no circumstances to be in a position where others could as a whole offer better or even as good apparatus.

Power plant construction has been our specialty, and while others may have an individual piece of apparatus possessing more or less merit, we have felt willing at all times to challenge comparison on power plant work as a whole. The success of this concern has been a matter of personal gratification to those who have shaped its policy. The reputation that the public has conceded us is regarded of more importance than any financial results, and we assure our patrons that it is our purpose to guard and live up to the reputation of being the leading designing and contracting engineering concern on the Pacific Coast, capable, mechanically and financially reliable.

The engineering organization is strong, both the Designing and Construction Departments having the best talent obtainable. By reason of our connection with many of the principal engineering establishments of the East, giving to us and to our customers the benefit of their skill, we feel we are in a position second to none, and we invite comparison along such lines.

Branch Offices are maintained in the principal sections of the Pacific Coast, the business of which is handled by experienced engineers, assuring customers, in any part of the Pacific Coast, advice and recommendations along the lines of the latest and best practice.

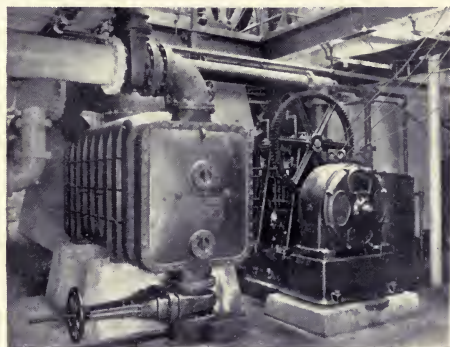
We are prepared to make plans and estimates, or undertake the installation of any class of motive power work in all its branches, electric railway or lighting plants, mining and milling machinery, hydraulic work, etc., of which the following pages show some examples.

We invite the most thorough investigation as to the work we have done, and what we are capable of doing. Continued orders from satisfied customers are to our mind the highest indorsement, and these we are able to show.

Respectfully,

**CHAS. C. MOORE & CO.,**

*Engineers.*





# INDEPENDENT ELECTRIC LIGHT & POWER CO.

## SAN FRANCISCO



This steam plant, the largest and unquestionably the finest installation on the Pacific Coast, and comparing favorably with anything installed in the world to date, is located in the Potrero district, San Francisco.

The plant, as it stands to-day, is a credit to all concerned, and is unrivaled in economy, reliable service, and general flexibility.

It is the first plant on the Pacific Coast to attempt on a large scale the parallel operation of 60 cycle alternators and is one of the few plants in the United States so operated to-day. Many doubts were expressed as to the outcome of the attempts in this direction, but the success secured and the daily satisfactory performance is the best answer. It cannot be too strongly urged on all parties interested in the production of electric power to visit the Independent Electric Light & Power Company's station, and they will be more than satisfied with their visit. "Seeing is believing," especially when indubitable proofs are there.

It is not practicable to attempt an extended description of this plant here, although the photographs on the opposite page will, to some extent, show the character of apparatus.

In the construction of this plant the engineer was not held down to a limited appropriation, but was instructed to provide the most modern and efficient installation that money could buy. The results secured in the way of economy and reliable service are offered as evidence as to whether these instructions were well carried out.

Below is given a partial list of the steam plant equipment:

**BOILERS.** Fifteen Babcock & Wilcox Boilers of forged steel construction, each boiler having three 42" drums, or forty-five 42" drums in all.

**ENGINES.** Five McIntosh & Seymour Vertical Cross Compound Engines, each direct connected to 1500 KW alternator. One McIntosh & Seymour Engine of same type, direct connected to 500 KW alternator. Two Vertical Tandem Compound McIntosh & Seymour Engines, each direct connected to 100 KW exciter.

**CONDENSING APPARATUS.** Six Wheeler Admiralty Surface Condensers for the above engines. Six Edwards Air Pumps, electrically driven. Two Wheeler Surface Condensers with combined air and circulating pumps, for exciter engines.

**ECONOMIZERS.** Green's Patent Fuel Economizers of suitable capacity for plant, specially constructed and arranged to work under varying load conditions.

**CHIMNEY.** One Self-Supporting Steel Stack.

**INDUCED DRAUGHT APPARATUS.** Four Induced Draught Steel Plate Steam Fans. Fan wheels 10' diameter, outside diameter housings, 15'. Each fan driven by direct connected engine.

**HEATERS.** Two 1200 HP Goulbert Vertical Auxiliary Feed Water Heaters.

**SEPARATORS.** Eight Stratton Receiver Separators.

**FEED PUMPS.** Four Snow Duplex Center Packed Plunger Feed Pumps.

**OIL PUMPS.** Snow Duplex Oil Pumps.

**VALVES.** Chapman Valves and Flanges.

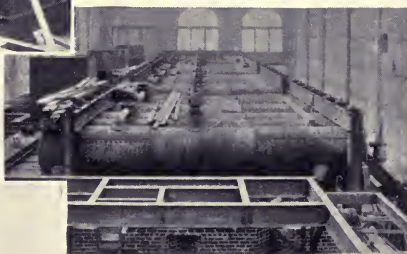
**AUXILIARY CIRCULATING PUMP.** One Quimby Screw Pump for auxiliary circulation.

**REGULATORS.** Two Spencer Patent Regulators.

**MONARCH ENGINE STOPS.** Monarch Engine Stops and Speed Limit.

**MISCELLANEOUS.** Various steam auxiliaries and appliances.

*Bulletin No. 5 with full particulars regarding the steam power plant of this installation will be furnished on application.*



# UNITED RAILROADS OF S. F.

## NORTH BEACH POWER HOUSE



The illustrations opposite show the new plant of the United Railroads of San Francisco located at North Beach. The building occupies a space of 113' by 317', and is located on the Bay shore.

The boiler room equipment is thoroughly up-to-date as seen in photographs, and the plant, in general, possesses many novel features, the induced draught system being particularly worthy of note as it is the largest that has been installed to date on the Pacific Coast. The fan wheels are 16' in diameter, the outside diameter of housings about 30'.

While it is not expected that it will be necessary to operate induced draught apparatus at moderate loads or under ordinary conditions, it provides reserve for peak loads or for abnormal conditions at a minimum original outlay.

The engines in the plant are vertical triple expansion, marine type furnished by a local builder.

The equipment furnished by Chas. C. Moore & Co., Engineers, was, in part, as follows:

**BOILERS.** Four batteries of Babcock & Wilcox Boilers, of forged steel construction, each battery consisting of six drums or twenty-four 42" drums in all.

**ECONOMIZERS.** A plant of Green's Economizers of suitable size for the boiler plant.

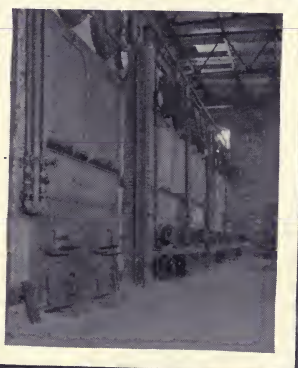
**INDUCED DRAUGHT.** Duplex Induced Draught Outfit, capable of easily handling maximum overloads of boilers under all atmospheric conditions.

**OIL BURNING SYSTEM.** Complete equipment of pumps, heaters, regulators, burners and connections for the work required.

**MISCELLANEOUS.** Various auxiliaries and steam devices needed for complete installation.

*Bulletin No. 6 with full particulars regarding the steam power plant of this installation will be furnished on application.*





# SOUTHERN PACIFIC TERMINAL CO.

## GALVESTON, TEXAS.



This plant has just been completed by the above company for the purpose of supplying power and light for its docks and grain elevator at Galveston, and has a capacity of about 2500 HP.

The grain elevator has a capacity of one million bushels, being the largest elevator in Texas, and one of the most complete in the United States. All the elevating devices, conveyors, and other mechanism are operated by separate motors, the elevator being arranged with double conveyor belts from the elevator to the docks, so that two vessels can be loaded at one time in four or five hours, the loading and unloading of the vessels being done with movable gang planks operated by electricity from the main station.

The description of the machinery, briefly, is as follows:

**BOILERS.** Six Babcock & Wilcox Boilers, all wrought steel construction.

**ENGINES.** Three High Speed Cross Compound Engines, direct connected to three 300 KW, 25 cycle alternating generators. McIntosh & Seymour High Speed Tandem Compound Engine, direct connected to 160 KW direct current generator.

**CONDENSERS.** Wheeler Admiralty Surface Condenser with capacity for the three main engines.

Blake-Knowles Air Pump for above condenser. Wheeler Centrifugal Pump direct connected to engine, furnishing circulating water for above condenser. Wheeler Admiralty Surface Condenser, with combined air and circulating pumps for McIntosh & Seymour Engine.

**FEED PUMPS.** Two Snow Duplex Boiler Feed Pumps.

**HEATER.** Goubert Feed Water Heater Vertical Pattern.

**HOTWELL.** Filtering Steel Hotwell.

**FUEL OIL SYSTEM.** Complete equipment of Pumps, Heater, Regulators, Air Chamber, Burners and connections for oil burning.

**PIPE AND FITTINGS.** Complete steam, exhaust, feed, suction and discharge pipe and fittings.

**VALVES.** All Chapman Straightway, double seated gate valves and Chapman flanges.

**MISCELLANEOUS.** Many other special steam appliances and auxiliaries.

*Bulletin No. 7 with full particulars regarding the steam power plant of this installation will be furnished on application.*





# NORTH SHORE RAILROAD

SAN FRANCISCO, CAL.



The management of the North Shore Railroad Co., on deciding to electrify their system from Sausalito to San Rafael, deemed it advisable to install a reserve steam plant at Alta, a station on their line near Corte Madera. In keeping with their policy of making substantial improvements, they decided to install a high-grade plant, so that, should conditions require them to operate for any extended period, they could do so economically. The plant being a reserve steam plant only, it is intended to operate but a portion of it, just sufficient to keep a station crew available, and the plant in shape to be called on at a moment's notice.

There are many novel features in this plant, adapted for the special conditions to be met, which space prevents fully describing here. It might be of special interest to state that the main McIntosh & Seymour engine is connected by a rope drive to two motor generating sets consisting of a railway generator coupled to a synchronous motor by means of jaw clutch, thus allowing either or both sets to be run at the same time by the engine. This accomplishes two ends:

First. The company can furnish direct current for the use of their railway.

Second. The synchronous motor can be used for furnishing alternating current to other customers of the Bay Counties Power Co. (for which this plant is a reserve) likewise, suffering from any lack of power during a possible interruption of the service. If necessary, from any cause, the synchronous motor can be disconnected from the railway generator by disconnecting the coupling bolts, and direct current only supplied.

The management kept in view the necessity in a reserve plant of an equipment that would permit of a heavy overload, and the installation, as briefly listed below, will compare favorably with any similar installation in the country. It comprises the following:

**BOILERS.** Three Babcock & Wilcox Boilers.

**ENGINES.** Horizontal Tandem Compound Condensing McIntosh & Seymour Engine, arranged for D. C. to 400 KW railway generators. Horizontal Tandem Compound Condensing McIntosh & Seymour Engine, 900 KW; arranged for rope drive, as above explained.

**CONDENSING APPARATUS.** Wheeler "Admiralty" Surface Condenser with combined air and circulating pumps, for large McIntosh & Seymour engine. Wheeler "Admiralty" Surface Condenser with combined air and circulating pump, for smaller McIntosh & Seymour engine.

**HEATER.** Vertical Goubert Auxiliary Feed Water Heater.

**FEED PUMPS.** Two Snow Duplex Feed Pumps.

**STEAM SEPARATORS.** Vertical Steam Separators for each of the above engines.

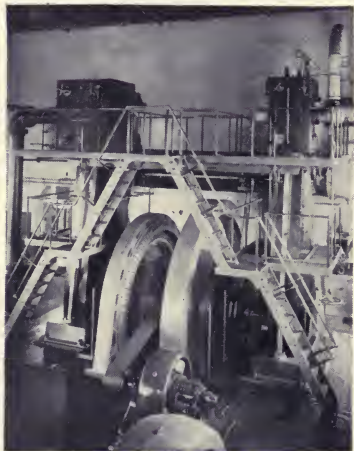
**RELIEF VALVES.** Necessary Horizontal Blake Automatic Atmospheric Exhaust Relief Valves.

**FUEL OIL SYSTEM.** Complete equipment of pumps, heater, regulators, air chamber, burners and connections for oil burning.

**VALVES.** Chapman Valves and Chapman Flanges throughout.

**MISCELLANEOUS.** Pipes and fittings, and various steam auxiliaries, appliances, etc.

*Bulletin No. 9 with full particulars regarding the steam power plant of this installation will be furnished on application.*



# UNITED ELECTRIC GAS & POWER CO.

## SANTA BARBARA



The illustrations opposite show one of the finest, if not the most modern and best equipped plant of its size on the Pacific Coast, or as many believe, in the United States.

The station generates electric current for lighting, power and electric railway service.

The circulating water from the condenser is discharged into the swimming tank of the large bath-house owned by the same Company on the beach nearby, a further source of revenue for the Company.

No expense was spared in having this equipment second to none. The contractors did their utmost to make a record for the purchasers as well as for themselves. The result has been most gratifying and a credit to all parties concerned.

The economy is remarkable and is an additional illustration, if further proof is necessary at this stage of steam plant development, of the wisdom of installing high grade apparatus.

Interested parties will be amply repaid by a visit to this station, where they can see a combination of economy, reliable service, good design and well installed work.

Attention is directed to the character of apparatus installed, which consists, in part as follows:

**BOILERS.** Three Babcock & Wilcox Boilers.

**ENGINES.** Vertical Cross Compound McIntosh & Seymour Engine, direct connected to 300 KW generator. Phoenix High Speed Tandem Compound Horizontal Engine, driving 200 KW generator.

**CONDENSING APPARATUS.** Wheeler Admiralty Surface Condenser. Edwards Air Pump electrically driven. Wheeler Centrifugal Circulating Pump. Snow Duplex Auxiliary Circulating Pump. **ECONOMIZERS.** Green's Patent Fuel Economizers of suitable size for boiler plant.

**INDUCED DRAUGHT APPARATUS.** Two Induced Draught Fans with direct connected engines for each.

**HEATER.** Goubert Vertical Feed Water Heater.

**SEPARATOR.** Two Stratton Receiver Separators.

**FEED PUMPS.** Two Snow Duplex Boiler Feeders.

**LUBRICATING SYSTEM.** Siegrist Lubricating System, complete, with pumps, oil and filter tanks.

**FUEL OIL SYSTEM.** Complete equipment of pumps, heater, regulators, air chamber, burners and connections for oil burning.

**VALVES.** Chapman Straightway double seated Gate Valves and Flanges.

**CRANE.** 15-ton Travelling Crane.

**HOT WELL.** Steel Filter and Hot Well.

**PIPES AND FITTINGS.** All steam, feed water, suction and discharge pipe and fittings.

**MISCELLANEOUS.** Various steam auxiliaries and appliances.

*Bulletin No. 13 with full particulars regarding the steam power plant of this installation will be furnished on application.*





# UNITED ELECTRIC GAS AND POWER COMPANY

SANTA MONICA, CAL.



This plant is located on the famous Santa Monica Beach, and adjoins the North Beach Bathhouse. It should be of considerable interest to owners and operators of small electric light stations, because it offers a suggestion of what might be done in many localities where several small electric stations are within transmitting distance of one another.

The generating plant at Santa Monica supplies electric lighting service at Santa Monica, and also transmits current at 22,000 volts to electric light sub-stations at Long Beach, Terminal Island, San Pedro and Redondo, these sub-stations having displaced small steam plants previously operated.

In 1896 or 1897 this company began operations with a couple of high-speed engines, return tubular boilers, and a corresponding equipment of auxiliaries, and in the latter part of 1899 they built the plant, in its present location making an extensive addition in 1900.

This installation is particularly noteworthy as being first started by the Santa Monica Electric Light & Power Co., from which was evolved the large and valuable property of the United Electric Gas & Power Co., one of the most extensive and valuable properties of its kind in Southern California. The economical and reliable showing made by this plant encouraged the owners to make their subsequent extensions.

The circulating water from the condensers is taken from the ocean through a long pipe line running out to the pier. This water, after being discharged from the condensers, is then sold to the North Beach Baths to supply the swimming tanks. This plant, as completed, comprises:

**BOILERS.** Four (4) Babcock & Wilcox Boilers.

**ENGINES.** Horizontal Cross Compound Hamilton Corliss Heavy Duty Engine, D. C. to 300 KW generator. Single Cylinder Hamilton Corliss Engine, belted to 200 KW generator.

**CONDENSING APPARATUS.** Two Wheeler "Admiralty" Surface Condensers with combined air and circulating pumps.

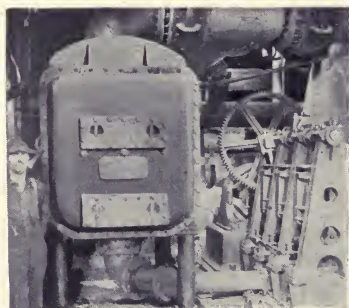
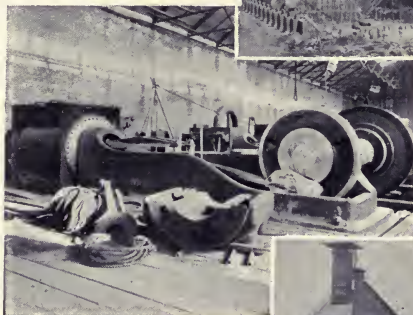
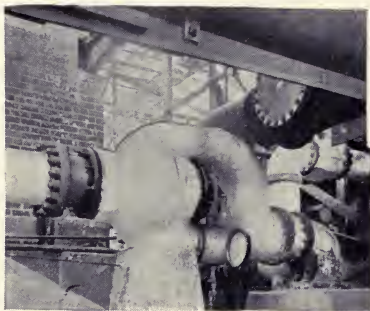
**ECONOMIZERS.** Green's Patent Fuel Economizers of suitable size for boiler plant.

**INDUCED GAS APPARATUS.** Two induced draft fans with direct connected engines for each.

**HEATER.** Goubert Vertical Feed Water Heater.

**MISCELLANEOUS.** Full equipment of high-grade feed pumps, fuel oil system, valves, and hot well, with all necessary steam auxiliaries and appliances.

*Bulletin No. 14 with full particulars regarding the steam power plant of this installation will be furnished on application.*





# PACIFIC ELECTRIC RAILWAY CO.

LOS ANGELES, CAL.



This Company is a combination of the principal street railways of Los Angeles.

The illustrations opposite show a plant of about 7000 HP. Further contracts or 5000 HP additional have been let at this writing (April, 1903).

The selection and arrangement of the machinery for this plant was made after thorough investigation of tried methods, adopting and elaborating on successful practice in eastern states and in Europe. There are many peculiar and special features incorporated in this plant, full particulars of which are shown in a bulletin, which will be furnished to interested parties on application.

The steam power equipment consists, briefly, of the following:

BOILERS. Babcock & Wilcox Boilers of forged steel construction.

ENGINES. Five McIntosh & Seymour Cross Compound Condensing Engines, each engine arranged for direct connection to one 1500 KW fifty cycle alternator. Engines especially equipped providing for parallel operation of alternators.

Engines have high pressure cylinders 28"

low " " 58"

Stroke 48"

Revolutions per minute 120

McIntosh & Seymour Engine of same type, arranged for direct connection to 1050 KW direct current generators, size 25 and 52 x 42; 120 revolutions per minute.

CONDENSERS. Separate Wheeler Admiralty Surface Condensers furnished for all engine units.

AIR PUMPS. All air pumps are Edwards Vertical Triplex Single Acting Suction Valveless electrically driven.

CIRCULATING PUMPS. Wheeler Centrifugal.

FEED PUMPS. Deane Vertical, electrically driven.

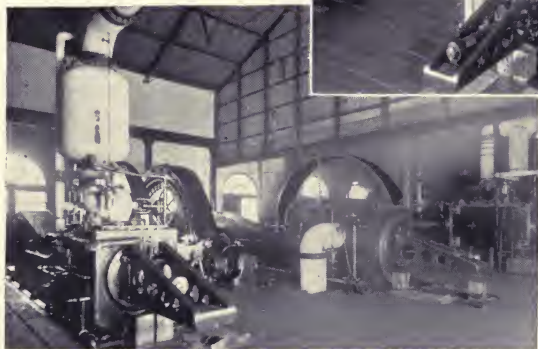
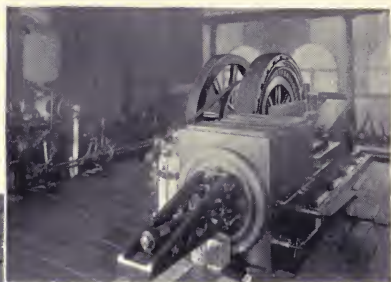
EXPANSION JOINTS. Pearson's Patent Balanced Joints.

VALVES. Chapman Valves and Flanges used throughout.

ENGINE STOPS. Monarch Engine Stops and Speed Limit.

MISCELLANEOUS. Many other special steam appliances and auxiliaries.

*Bulletin No. 15 with full particulars regarding the steam power plant of this installation will be furnished on application.*



# PACIFIC LIGHT & POWER CO.

## LOS ANGELES



This Company, successor to the San Gabriel Electric Co., owns and operates electric power transmission plants located at San Gabriel Canyon, San Antonio and Azusa. Its steam power plants, intended for reserve, are located in Los Angeles.

The Company, recognizing the advisability of high-grade steam equipment even in reserve power plants, has recently placed contract for considerable extension, and the character of work will be shown in the following:

**BOILERS.** Three Babcock & Wilcox Boilers of forged steel construction.

**ENGINES.** One McIntosh & Seymour Horizontal Cross Compound Engine, arranged for direct connection to 1500 KW 50 cycle alternator. One McIntosh & Seymour Engine, same type, arranged for direct connection to 750 KW 50 cycle alternator. One 28 x 60 Horizontal Single Cylinder Hamilton Corliss Engine, driving 300 KW 50 cycle alternator. One Horizontal Tandem Compound McIntosh & Seymour Engine, direct connected to 75 KW exciter.

**CONDENSERS.** Two Wheeler Admiralty Surface Condensers.

**AIR PUMPS.** Edwards Single Action Suction Valveless Air Pumps, electrically driven.

**HEATER.** Goubert Vertical Feed Water Heater.

**RECEIVER SEPARATOR.** Stratton High Pressure Receiver Separator.

**FEED PUMPS.** Two Snow Duplex Center Packed Plunger Pumps.

**MISCELLANEOUS.** Pipes and fittings and various steam auxiliaries and appliances.

*Bulletin No. 16 with full particulars regarding the steam power plant of this installation will be furnished on application.*





# SPRECKELS SUGAR CO.

SPRECKELS, CAL.



The Beet Sugar Factory of the Spreckels Sugar Co., located at Spreckels, Cal., a few miles from Salinas, is the largest in the world. The magnitude of the establishment can be realized when one considers that the capacity is between 3500 and 4000 tons of sugar beets daily or an output of from 400 to 500 tons of sugar every day it is in operation.

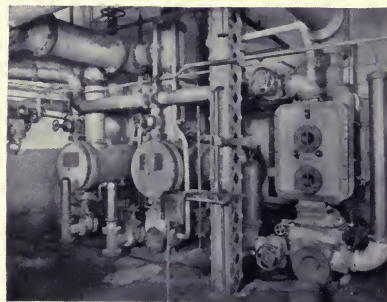
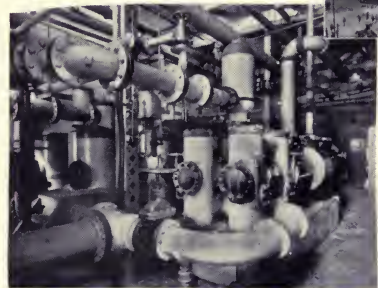
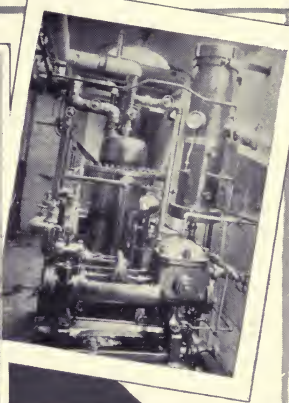
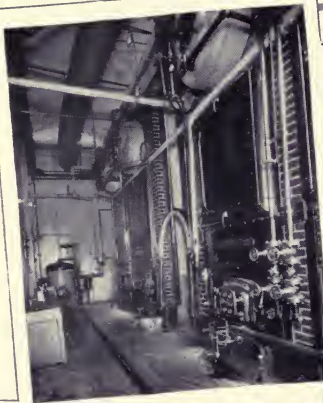
For power purposes and for boiling the beets, the Babcock & Wilcox boilers in use are required to evaporate 270,000 pounds of steam hourly, or 9000 H. P. Centennial rating. This is the largest steam boiler plant to date on the Pacific Coast.

In the main boiler room there are twenty-four furnaces, each furnace having two 42" x 23 1/2" drums with corresponding sections of tubes, making in all forty-eight single drums. Greens' Patent Fuel Economizers are used of suitable size for the boiler plant.

Arrangement of the Babcock & Wilcox boilers is fairly well shown by the illustrations on opposite page which also give an idea of the size of this plant. In addition to the boilers and economizers, the publishers furnished a large amount of steam auxiliaries and appliances for this establishment.

The economy and low cost of maintenance of this plant is a matter of record, and those who have been favored by invitations from The Spreckels Sugar Co., to visit the factory have been surprised and more than pleased at the design, arrangement and general appearance of the entire equipment as well as the results that have been secured.

*Bulletin No. 17 with full particulars regarding the steam power plant of this installation will be furnished on application.*





# CLAUS SPRECKELS BUILDING

SAN FRANCISCO, CAL.

The Claus Spreckels Building, located at Third and Market streets, San Francisco, ranks among the very highest, in point of architectural excellence, erected on the Pacific Coast to date.

By reason of limited ground area available, the power plant is located on Stevenson street near Third, close to the building. It is especially noteworthy as showing the ability of a well designed and properly constructed plant to meet heavy overloads, and yet with all, showing satisfactory economy. The plant is conveniently arranged and most excellently kept up.

This plant is worthy of note as being a station that operates condensing, remote from a supply of cheap circulating water. The operation of the engines condensing is effected by means of a cooling tower located on the roof of the building, the heated circulating water from condenser being pumped to the tower on the roof, where it is distributed over galvanized wire mats. A blower forces air up between the mats, which cools the injection water sufficiently, so that on its return to the condensers a vacuum of 24" is maintained.

Interested parties would be well repaid by a visit, showing, as it does, the maximum power combined with economical and reliable service that can be installed in a limited space.

The plant produces power for operating electric lights, elevator service and steam heating in the Claus Spreckels Building, Claus Spreckels Building Annex, Spreckels Market, and also power, light and heat necessary for the work required in the pressrooms of the San Francisco Call.

The plant in brief is as follows:

**BOILERS.** Four Babcock & Wilcox Boilers of forged steel construction throughout.

**ENGINES.** Three Compound High Speed Condensing Engines, each direct connected to 100 KW generator. One Compound Vertical Forbes Engine (Marine type) direct connected to 25 KW generator.

**CONDENSING APPARATUS.** Three Wheeler "Admiralty" Surface Condensers with combined air and circulating pumps.

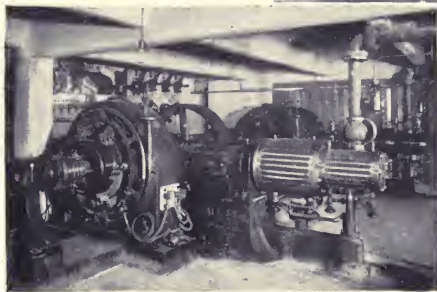
**COOLING TOWER.** Barnard Wheeler Tower located on roof of power-house.

**PUMP.** Snow Duplex Elevator Pump.

**FUEL OIL SYSTEM.** Complete equipment of pumps, heater, regulators, air chamber, burners and connections for oil burning.

**MISCELLANEOUS.** Various auxiliaries and appliances.

*Bulletin No. 19 with full particulars regarding the steam power plant of this installation will be furnished on application.*



## RIALTO BUILDING

SAN FRANCISCO, CAL.



This is one of the finest of the modern office buildings in San Francisco, located at New Montgomery and Mission streets.

After thorough consideration the owner decided to install his own plant, and no expense was spared to make it thoroughly up-to-date. Practical results show the cost of operation for producing electrical current for light and elevators and heat required for the building is much less than rates that could be obtained from any of the power-furnishing companies. In fact, the cost of power production in this plant has been a matter of considerable surprise to those who do not realize the advantage of high-grade apparatus selected with a special view to suit the special conditions. Interested parties who contemplate work of this kind would do well to investigate the performance of this plant.

It consists in part of the following:

BOILERS. Two Babcock & Wilcox Cross Drum Boilers arranged with special oil-burning furnaces.

ENGINES. Two Tandem Compound Horizontal Non-condensing Self-oiling "Ideal" Engines, arranged with extended subbase for D. C. to 75 KW generators.

HEATER. Goubert Vertical Feed Water Heater.

SEPARATORS. Two Stratton Steam Separators.

FEED PUMPS. Two Snow Duplex Boiler Feed Pumps.

PRESSURE REGULATORS. Two Class "E" Leslie Pressure Regulators.

FUEL OIL SYSTEM. Double pumping outfit complete with pumps, heater, regulator, air chambers, burners and connections.

GREASE EXTRACTOR. Peerless Grease Extractor.

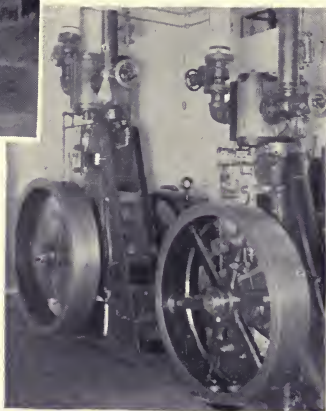
VALVES AND FLANGES. Chapman Valves and Chapman Flanges used throughout.

PIPING. All Oil, steam, exhaust and feed water piping necessary for operation of the plant

MISCELLANEOUS. Various steam auxiliaries and appliances.

*Bulletin No. 23 with full particulars regarding the steam power plant of this installation will be furnished on application.*





# ANGELUS HOTEL

LOS ANGELES, CAL.



This establishment is one of the modern Los Angeles hotels, located at Fourth and Spring streets, Los Angeles. Heat, light and power are furnished by plant located in the basement, furnishing power for electric elevators and lighting service, hot water, steam for heating, and for operating five-ton ice plant.

The plant consists of :

BOILERS. Two Babcock & Wilcox Boilers of forged steel construction.

ENGINES. One Single, Vertical Engine direct connected to 37½ KW generator. One Single Vertical Engine direct connected to 62½ KW generator.

FEED WATER HEATER. Goubert Vertical Heater.

HOT WATER HEATER. Goubert Vertical Heater.

FEED PUMPS. Snow Duplex Boiler Feeders.

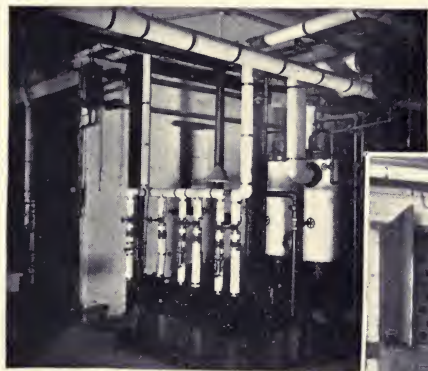
OIL BURNING SYSTEM. Complete, equipment of pumps, heaters, air chambers, burners and connections for oil burning.

TANK PUMP. Snow Duplex Low Service Pump.

VALVES. Chapman straightway, double-seated gate valves.

MISCELLANEOUS. Grease Extractor and various auxiliary apparatus, with pipe and fittings complete.

*Bulletin No. 24 with full particulars regarding the steam power plant of this installation will be furnished on application.*





# CONSERVATIVE LIFE BUILDING

LOS ANGELES, CAL.



A modern office building, located at Third and Hill streets, Los Angeles, thoroughly up to date in all respects.

Steam plant in the building furnishes steam for the elevator, pumps and for the heating system. Hot water is also provided to all offices by simple but efficient means of double heaters and special system of Chas. C. Moore & Co., Engineers.

The plant consists, in part, of the following :

BOILERS. Two Babcock & Wilcox Cross Drum Boilers.

FEED WATER HEATER. Goubert Vertical Heater.

HOT WATER HEATER. Goubert Heater specially arranged for hot water circulation.

PUMPS. Snow Duplex Pumps for boiler feed and Snow Duplex for house service.

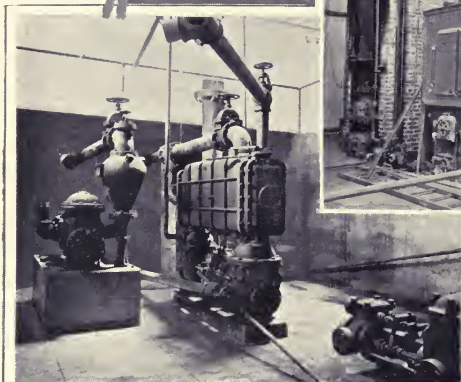
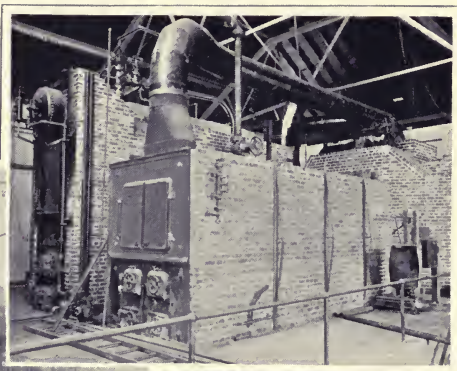
OIL-BURNING SYSTEM. All necessary pumps, heater, valves, connections, etc., for oil burning.

VALVES. Chapman straightway, double-seated gate valves.

PIPE AND FITTINGS. Steam, exhaust, feed water, suction and discharge piping.

MISCELLANEOUS. Many other special auxiliaries, steam appliances, etc.

*Bulletin No. 25 with full particulars regarding the steam power plant of this installation will be furnished on application.*



# LELAND STANFORD JR. UNIVERSITY

## MECHANICAL LABORATORY, PALO ALTO, CAL.



Owing to the lack of experimental apparatus in the mechanical laboratory of this University, the students were handicapped in this line of study and it was therefore decided in 1902 to complete the partial plant already installed by adding to it a high pressure steam generating plant equipped with all the apparatus found in the best modern power stations. This plant, consisting of the machinery described below, was installed so that any kind of solid or liquid fuel may be tested under various conditions. Tests may be conducted with or without the economizer, air heater or induced or forced draught apparatus.

The new portion of this laboratory, which is by far the most important part of it, at present consists of the following:

BOILERS. Babcock & Wilcox Boiler of forged steel construction throughout.

SUPERHEATER. Babcock & Wilcox Superheater furnished with above boiler.

ENGINES. Ideal Tandem Compound Engine belted to generator.

CONDENSING APPARATUS. Wheeler Admiralty Surface Condenser with combined air and circulating pumps.

ECONOMIZER. Green's Patent Fuel Economizer of suitable size for this installation.

AIR HEATER. Air Heater, consisting of 200 cast iron tubes.

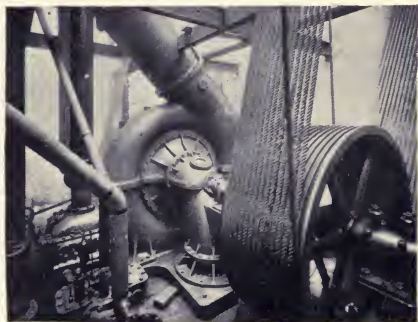
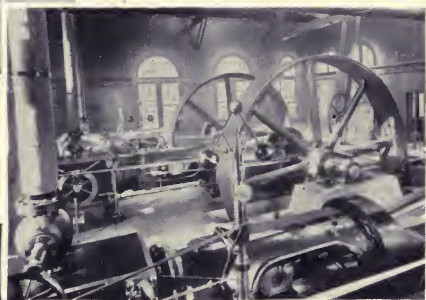
INDUCED DRAUGHT APPARATUS. Induced Draught Steam Fan, arranged with direct connected engine.

FORCED DRAUGHT FAN. Forced Draught Fan, driven by independent engine.

REGULATING VALVE. Regulating Valve automatically regulating the speed of induced draught fan engine.

MISCELLANEOUS. Various steam auxiliaries and appliances.

*Bulletin No. 29 with full particulars regarding the steam power plant of this installation will be furnished on application.*





# SAN FRANCISCO DRY DOCK CO.

## HUNTERS' POINT, CAL.



The interesting plant illustrated on opposite page is located at Hunters' Point. This is of modern equipment and has proven very satisfactory for the work required, in which reliability is of prime importance.

The plant consists of the following:

BOILERS. Seven Babcock & Wilcox Boilers.

ENGINES. Three Horizontal Corliss Engines, with rope drive connection to centrifugal dock pumps. (Separate contract.)

PUMPS. Three Double Suction Centrifugal Pumps, 38" discharge.

HEATER. 1500 HP Goubert Vertical Feed Water Heater.

DRAINAGE PUMP. Duplex Brass Fitted Drainage Pump.

FEED PUMPS. Two Snow Duplex Boiler Feeders.

FUEL OIL SYSTEM. Complete equipment of pumps, heater, air chamber, burners and connections for oil burning.

SEPARATORS. Three Stratton Separators.

VALVES. Chapman Straightway double seated Gates and Flanges.

MISCELLANEOUS. Pipes and fittings and various steam auxiliaries and appliances.

*Bulletin No. 30 with full particulars regarding the steam power plant of this installation will be furnished on application.*



# UNITED STATES BRANCH MINT

SAN FRANCISCO, CAL.



This famous institution is situated at the corner of Fifth and Mission Sts., San Francisco.

The plant selected, as illustrated opposite, was the result of extensive competition and was awarded on the basis of quality and economical advantages secured.

The equipment consists of:

**BOILERS.** Four Babcock & Wilcox Boilers, of forged steel construction throughout.

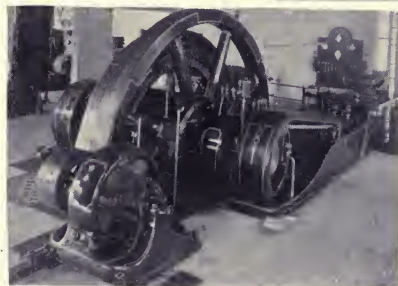
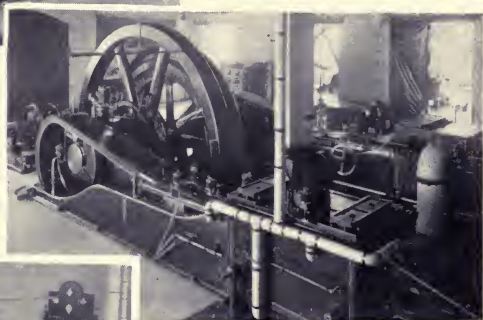
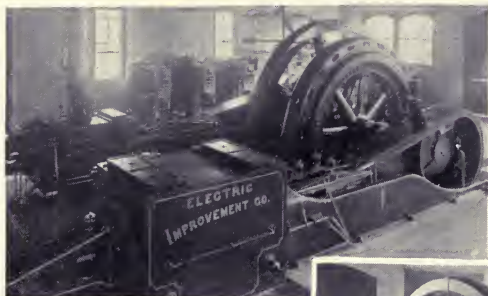
**FEED PUMPS.** Four Snow Duplex Feed Pumps, mounted on special heavy cast iron drip pans.

**FILTER** Feed Water Filter in main feed line.

**VALVES.** Chapman Straightway double seated Gate Valves and Chapman Flanges throughout.

**PIPES AND FITTINGS.** Complete steam, exhaust, feed, suction and discharge pipes.

**MISCELLANEOUS.** Various other steam auxiliaries and steam appliances.





## UNITED GAS & ELECTRIC CO.

SAN JOSE, CAL.



This Company is a combination of various electric lighting and gas companies in San Jose, principal among which was the Electric Improvement Co., of San Jose, for whom the plant illustrated was installed.

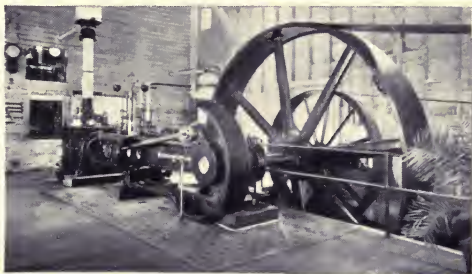
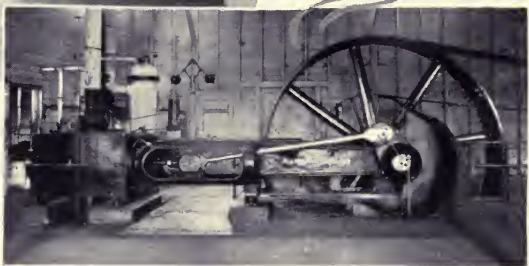
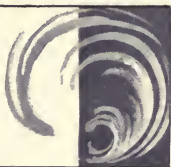
This plant is used as a reserve for and in connection with the Standard Electric Company's distributing system for San Jose and vicinity.

The plant has had quite a remarkable record. At the time of installation 300 KW capacity was considered ample for all needs but as the McIntosh & Seymour Engine could readily carry overloads and as the price and delivery of a 400 KW generator was satisfactory, it was decided to put the 400 KW alternator on the 300 KW engine. The change of ownership and growth of the plant put further heavy demands on the engine and it is a matter of record that the average load on the McIntosh & Seymour engine in this station has been 500 KW or a steady overload of  $66\frac{2}{3}\%$ , and with peak loads materially in excess of this.

The station is equipped with Babcock & Wilcox boilers and usual equipment of auxiliaries and special steam appliances.

This plant has been particularly favorably commented on by the mechanical and electrical engineering fraternity and a visit to it would well repay an interested party.

*Bulletin No. 31 with full particulars regarding the steam power plant of this installation will be furnished on application.*



# THE ETHANAC CO.

ETHANAC, CAL.



The Ethanac Co., of Ethanac, Cal., was organized by the Chase Nursery Co., of Riverside, Cal., to develop a large tract of fruit and grain land owned by them in the Perris Valley, some twenty miles distant from Riverside. The uncertain rainfall in that section, together with the fact that there was an immense subterranean flow of water under their land, induced the Ethanac Co., to install a large pumping plant to be independent of rainfall. They decided on a separate generating station from which current is taken to various substations or pump houses in different parts of their land, enabling the operation of any section as they saw fit, and the pumping stations were arranged so as to secure a maximum amount of land to be supplied by each station or district, thereby preventing the elevation of water to any greater head than necessary.

In their system various forms of pumps are used, Triplex, Rotary and Centrifugal, as the conditions warrant. This Company has been very successful, and, so far as known, is the pioneer in this line of work. Abundant water is secured of from 25 to 50 feet below the surface. The plant has had a remarkable record, having operated day and night without stop as much as 50 days at a time. The abundant water in this section has made it advisable to extend their distributing system through cement ditches to Corona, some thirty miles distant.

An additional boiler and second engine has been put in since the first installation.

This Company has very complete records of cost of pumping water which confirms the statements of the contractors, and proves the advantages of economical and reliable steam machinery for this class of work.

The plant consists of the following:

BOILERS. Three Babcock & Wilcox Boilers.

ENGINES. Two Condensing Hamilton Corliss Engines.

ECONOMIZERS. Green's Patent Fuel Economizers.

CONDENSING APPARATUS. Wheeler Admiralty Surface Condenser, with Combined Air Circulating Pumps.

SEPARATORS. Two Stratton Steam Separators.

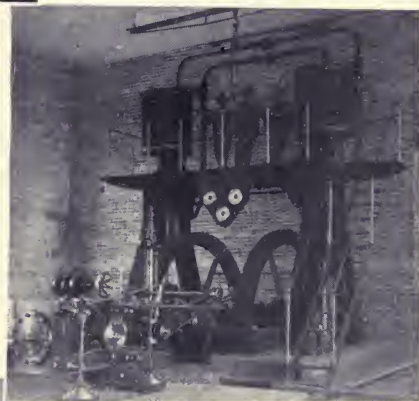
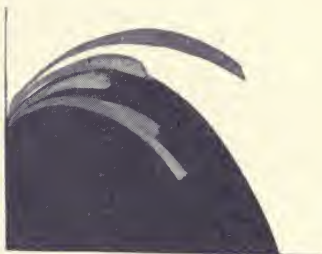
FEED PUMPS. Two Snow Duplex Boiler Feed Pumps.

FUEL OIL SYSTEM. Complete equipment of pumps, heaters, regulators, air chambers, burners and connections for oil burning.

VALVES AND FLANGES. Chapman Valves and Flanges used throughout.

MISCELLANEOUS. Pipe and fittings, various steam auxiliaries and appliances.

*Bulletin No. 35 with full particulars regarding the steam power plant of this installation will be furnished on application.*





# DOUGLAS IMPROVEMENT CO.

## DOUGLAS, ARIZ.



This concern recently organized in the thriving and rapidly growing town of Douglas, A. T., has installed a combined electric light, ice and refrigerating plant.

After thorough consideration of various proposals submitted, a plant was selected, not for lower first cost, but by reason of reliable and economical service, and as best suited for their exacting conditions, as follows:

BOILERS. Two Babcock & Wilcox Boilers.

ENGINE. Horizontal Tandem Compound Condensing McIntosh & Seymour Engine, arranged for direct connection to two 50 KW generators.

ECONOMIZERS. Green's Patent Fuel Economizers.

INDUCED DRAFT APPARATUS. Fullhousing Steel Plate Induced Draft Fan, with direct connected engine, equipped complete with regulator.

STACK. Steel stack.

HOT WELL. Steel filtering hot well.

CONDENSING APPARATUS. Wheeler "Admiralty" Surface Condenser with combined air and circulating pumps.

FEED WATER HEATER. Vertical Goubert Feed Water Heater.

OIL HEATER. Goubert Special Oil Heater.

STEAM SEPARATOR. Stratton Steam Separator.

FEED PUMP. "Admiralty" Vertical Duplex Feed Pump.

FIRE PUMP. Duplex Fire Pump.

FUEL OIL SYSTEM. Complete equipment of pumps, heaters, regulators, air chambers, burners and connections for oil burning.

VALVES AND FLANGES. Chapman Valves and Chapman Flanges used throughout.

MISCELLANEOUS. Pipe and fittings and various steam auxiliaries and appliances.

*Bulletin No. 36 with full particulars regarding the steam power plant of this installation will be furnished on application.*



## A. SCHILLING & CO.

SAN FRANCISCO, CAL.



The illustration opposite shows the palatial new home of the world-wide known firm of A. Schilling & Co., dealers in teas, coffees, spices, etc., which without question is one of the finest, if not the best appointed and equipped establishment of its kind in this country, and in thorough keeping with the high reputation of this firm.

The selection of a power plant was made along the same lines that prompted the construction and fitting up of the entire establishment, the firm desiring a model plant, the first cost not being the determining factor, but economical and reliable service being the main consideration.

Interested parties could most profitably visit this plant, where they could see what a pleasing combination can be made of high grade and economical apparatus well designed and arranged when given intelligent attention in its operation. This certainly is one of the model small steam power stations of the Pacific Coast.

Among many proposals submitted, the firm selected as best suited to their requirements the following:

BOILERS. Babcock & Wilcox Boiler.

ENGINES. Tandem Compound Horizontal Non-condensing, Self-oiling "Ideal" Engine, arranged for direct connection to generator.

HEATERS. Goubert Vertical Feed-water Heater.

SEPARATORS. Stratton Steam Separator.

FEED PUMPS. Snow Duplex Boiler Feed-pump.

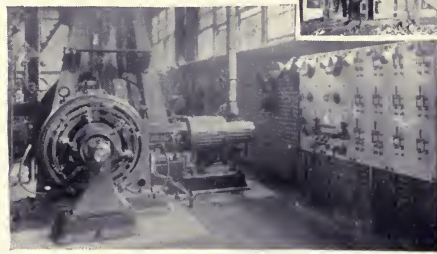
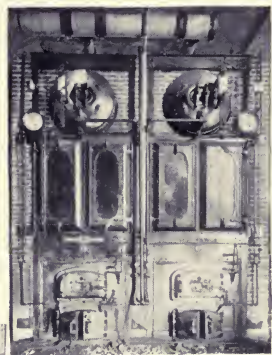
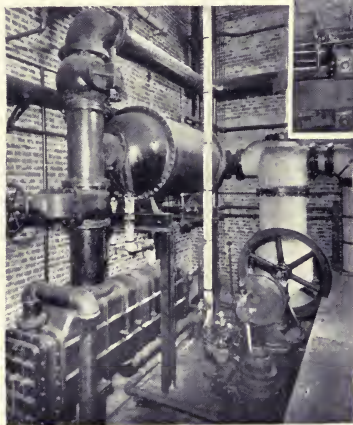
FUEL OIL SYSTEM. Double pumping outfit complete with pumps, heaters, regulators, air chambers, burners and connections.

VALVES AND FLANGES. Chapman Valves and Chapman Flanges throughout.

PIPING. All oil, steam, exhaust and feed-water piping necessary for operation of plant.

MISCELLANEOUS. Various steam auxiliaries and appliances.

*Bulletin No. 37 with full particulars regarding the steam power plant of this installation will be furnished on application.*





# MERCHANTS ICE AND COLD STORAGE CO.

## SAN FRANCISCO



This plant, recently installed, is one of the most modern, for this class of work, on the Pacific Coast. The results thus far secured are most satisfactory and have demonstrated to the purchasers the advantage of securing an economical equipment even at a considerable increase in first cost. The plant is well worth a visit by interested parties.

The equipment consists, in part, as follows:

BOILERS. Three Babcock & Wilcox Boilers.

ENGINES. Two Ideal, Tandem Compound Engines, each direct connected to 50 KW generator.

CONDENSING OUTFIT. One Wheeler Admiralty Surface Condenser with combined air and circulating pumps.

HEATER. Goubert Vertical Feed Water Heater.

SEPARATOR. Stratton Separators.

CIRCULATING PUMPS. Two Snow Compound Duplex Pumps for brine circulation.

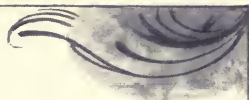
BRINE PUMPS. Two Snow Duplex Pumps for brine circulation of the indirect system.

DISTILLED WATER PUMPS. Two Snow Duplex Pumps.

FUEL OIL SYSTEM. Complete, with pumps, heater, air chamber, burners and connections.

MISCELLANEOUS. Pipe and fittings, and various steam auxiliaries, appliances, etc.

*Bulletin No 38 with full particulars regarding the steam power plant of this installation will be furnished on application.*



# SEASIDE WATER CO.

LONG BEACH, CAL.



This company is the owner of large bath-houses at Long Beach, the plant for which (as illustrated on opposite page) has many unique features.

For the main swimming tank in the baths a supply of salt water amounting to 900 gallons per minute is required. This is drawn by the pump in the station through 500 feet of pipe, which is laid along the wharf, through a Wheeler Condenser, the shell of which is filled with live steam, the water to be heated being passed through the tubes of the condenser. The water thus discharged has an average temperature of about 85 deg.

The plant has proven very successful and is economical in its working.

The apparatus consists in part of the following :

BOILER. Babcock & Wilcox Boiler.

CONDENSER. Wheeler Admiralty Surface Condenser with steam actuated air pump.

CIRCULATING PUMP. Independent Snow Circulating Pump, brine fitted, which draws the water from the ocean, passing same through the condenser into the swimming tank.

FEED PUMPS. Two Snow Duplex Brass Fitted Boiler Feed Pumps.

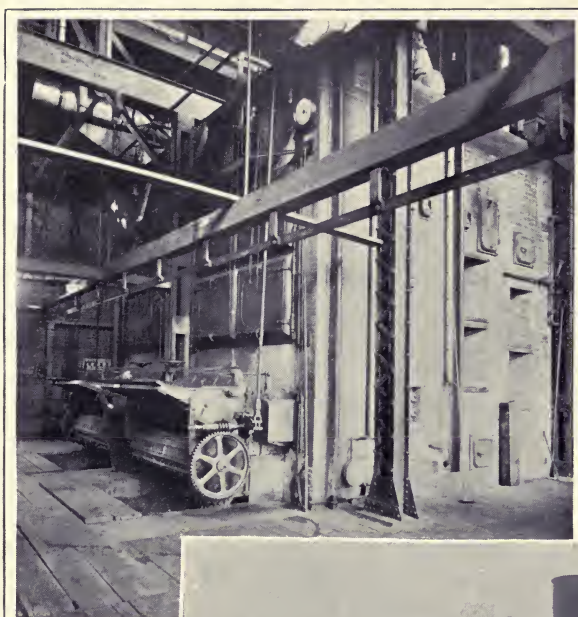
HEATER. Goubert Vertical Feed Water Heater.

FUEL OIL SYSTEM. Complete, equipment of necessary pumps, heaters, air chamber, burners and connections for oil burning.

VALVES. Chapman Standard Valves and Flanges.

MISCELLANEOUS. Hot well, pipes and fittings and various steam appliances for operation of complete plant.

*Bulletin No 39 with full particulars regarding the steam power plant of this installation will be furnished on application.*





# DIAMOND ICE AND STORAGE CO.

SEATTLE, WASH.



A very complete and efficient plant, and one that has been the subject of much comment, was recently installed by the Diamond Ice and Storage Co. in Seattle. The efficiency secured has been remarkable. It has enjoyed the unique distinction, which has been freely commented on in the local newspapers, of being the only plant in Seattle operating with local coals that has given no trouble from smoke. The smoke nuisance is a most serious one, and committees of protesting citizens, bothered with the soot descending from unconsumed coal passing out of the various chimneys in Seattle, have referred to this plant as proof that the local coals of that section can be burned without smoke, which has been regarded by many heretofore as impossible. The illustrations opposite give an idea of the character of the installation, which has been most satisfactory to the purchasers from a standpoint of reliable and economical service:

The features of main interest in this plant, and which have produced the results as stated above, are as follows :

BOILERS. Two Babcock & Wilcox Boilers.

SUPERHEATERS. Babcock & Wilcox Superheater for each boiler, with a capacity to produce from 100 to 150 degrees of superheat.

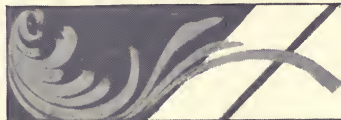
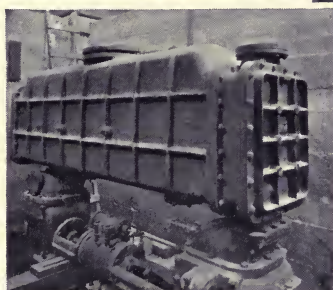
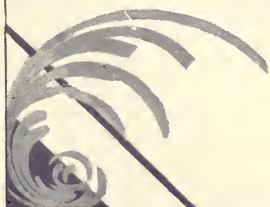
STOKERS. Two Babcock & Wilcox Chain Grate Stokers (which positively eliminates smoke).

ECONOMIZER. Green's Patent Fuel Economizer.

INDUCED DRAFT OUTFIT. Duplex Induced Draft Fan with direct connected engine.

FAN ENGINE REGULATOR. Spencer Regulator for Fan Engine, automatically governing speed, maintaining uniform steam pressure in boilers.

*Bulletin No. 40 with full particulars regarding the steam power plant of this installation will be furnished on application.*



# CALIFORNIA PORTLAND CEMENT CO.

COLTON, CAL.



The California Portland Cement Co. has an extensive plant for the manufacture of Portland cement, lime, marble dust and crushed rock at the base of Slover Mountain, near the town of Colton. It employs about one hundred and fifty men. The capacity of the plant is approximated at 400 barrels of cement and 400 barrels of lime daily, and a large output of crushed rock.

Appreciating the necessity of reducing its operating costs, as well as to keep pace with the growth of its business, the management decided to install a more modern plant, reliability and efficiency being the main considerations. The different parts of the plant are operated by motors with current generated in the central power station. The plant consists of the following:

BOILERS. Four Babcock & Wilcox Boilers.

ENGINE. Horizontal Compound Medium Speed Automatic Engine.

CONDENSING APPARATUS. Wheeler "Admiralty" Surface Condenser with combined air and circulating pumps.

HEATERS. Vertical Goubert Feed Water Heater.

FEED PUMPS. Two Snow Duplex Boiler Feed Pumps.

SEPARATOR. Stratton Steam Separator.

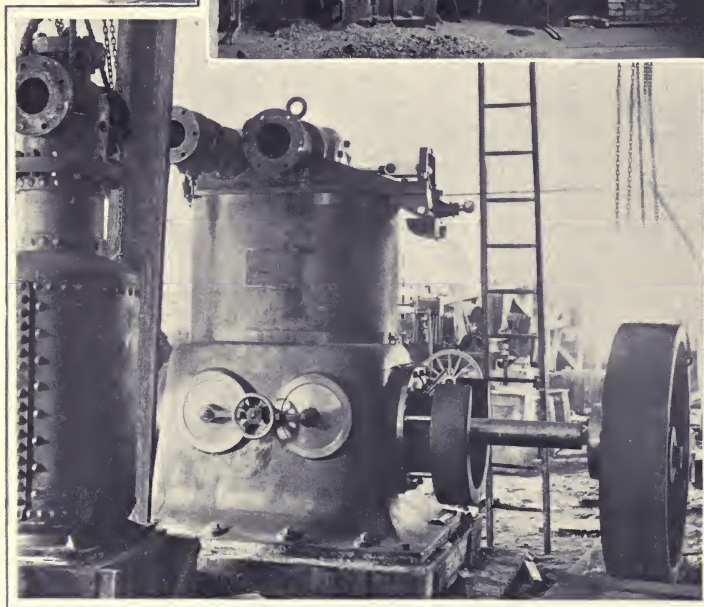
FUEL OIL SYSTEM. Complete equipment of pumps, heater, regulator, air chambers, burners and connections for oil burning.

VALVES AND FLANGES. Chapman Valves and Chapman Flanges used throughout.

HOT WELL. Steel Filtering Hot Well.

MISCELLANEOUS. Pipes and fittings, and various auxiliaries and appliances.

*Bulletin No. 43 with full particulars regarding the steam power plant of this installation will be furnished on application.*





# PALO ALTO WATER AND LIGHT WORKS.

PALO ALTO, CAL.



This is a municipal plant, the first installation being a water tube boiler, Corliss engine and the usual auxiliaries and equipment. An extension being necessary, and the Board of Trustees having advantage of the engineering advice of the mechanical department of the Leland Stanford Jr. University, after consideration of various proposals submitted, decided on the installation of the apparatus as shown on illustration opposite.

This extension comprises:

BOILER. Babcock & Wilcox Boiler.

ENGINE. Compound Non-condensing Westinghouse Engine and high-grade equipment of auxiliaries necessary for the proper handling of the plant.

It is expected, the size and all conditions considered, that this municipal plant will compare favorably with any similar installation, and there are a number of special features in connection with this plant which induced its selection, which space prevents giving it length here, but which will be gladly furnished to interested parties.



# CALIFORNIA COTTON MILLS CO.

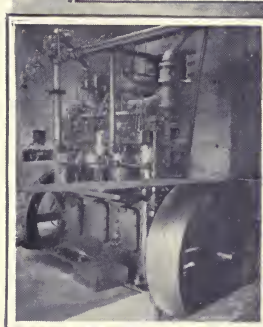
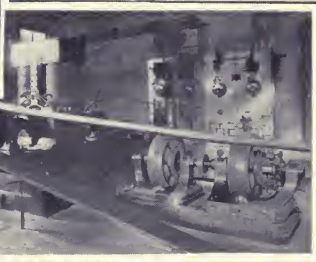
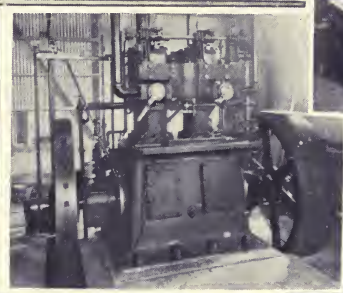
EAST OAKLAND, CAL.



This well-known institution, one of California's leading industrial works, is located at East Oakland, where it has been in operation nearly twenty-five years.

It has been the most successful of all the Coast companies in this line of work, which success has in no small degree been secured by the management appreciating the immense advantages in reducing operating cost of fuel, and realizing that high grade equipment is the only certain means to that end.

As increased business has demanded extensions of this plant, the publishers have from time to time installed Babcock & Wilcox Boilers (6), Green's Patent Fuel Economizers, Wheeler Condensers, Edwards' Air Pumps, Engines, Steam and Power Pumps, Heaters, Separators, Valves, Oil Burning Equipments and various modern auxiliaries and appliances.





# SAN JOSE AND SANTA CLARA ELECTRIC RY. CO'S. POWER STATION.

SAN JOSE, CAL.



The station is situated at the entrance of Alum Rock Canyon, about six and one-half miles from San Jose, and two and one-half miles from the city park at Alum Rock.

There is a three per cent grade from the station to the end of the canyon, and another slight grade on the San Jose side. The station is situated so as to affect the most economical distribution of current. The Company also operates an extensive railway system in San Jose.

Power is furnished by Westinghouse Vertical Gas Engines, operating on California Crude Oil. The first engine was installed in March 1902, and the second in February 1903. The total capacity on a crude oil rating is about 250 brake horse power.

The storage battery room adjoins the engine room and contains: 264 Chloride Accumulators, type 7-F, having a one hour discharge rate of 120 amperes, with glass jars of type 13-F, allowing for 100% increase in capacity.

The Gas Engine equipment is of sufficient capacity to take the average load during the heavy travel in summer, the battery taking all fluctuations above the average and maintaining a steady, full load on the generator.

The fuel costs at this station have been within three and four tenths of a cent per K. W., using crude oil at \$1.13 per barrel.

*Bulletin No. 45 with full particulars regarding the steam power plant of this installation will be furnished on application.*

# HONOLULU RAPID TRANSIT AND LAND CO.

HONOLULU, H. T.



This company operates an extensive system of street railways in the city of Honolulu, H. T. While Honolulu is comparatively a small city, especially when the white population is considered, to maintain a plant of this size, still it has been a great success financially and economically, both of which results have in no small degree been secured by reason of the character of the high-grade power plant installation. This plant will compare favorably with any similar installation anywhere in this country and consists of the following:

BOILERS. Three Babcock & Wilcox Boilers.

ENGINES. Three Tandem Horizontal Heavy Duty Hamilton Corliss Engines, each arranged for D. C. to 300 KW generator.

ECONOMIZER. Green's Fuel Economizer.

CONDENSING APPARATUS. Three Wheeler "Admiralty" Surface Condensers with combined air and circulating pumps.

HEATER. Goubert Auxiliary Vertical Feed Water Heater.

SEPARATORS. Three Stratton Receiver Separators of especially large capacity.

LUBRICATING SYSTEM. Siegrist Automatic Oiling System complete with pumps, tables, special oil cups, etc.

FEED PUMPS. Two Snow Duplex Boiler Feed Pumps.

GRAVITY RETURN SYSTEM. Holly Patent Gravity Return System, returning to the boilers all drips and condensation from separator, receivers, piping, etc.

FUEL OIL SYSTEM. Complete equipment of pumps, heaters, regulators, air chambers, burners and connections for oil burning.

VALVES AND FLANGES. Chapman Valves and Chapman Flanges used throughout.

MISCELLANEOUS. Pipe and fittings, various steam auxiliaries and appliances.

*Bulletin No. 48 with full particulars regarding the steam power plant of this installation will be furnished on application.*

# HILO ELECTRIC POWER CO.

HILO, HAWAII



This company owns the water power transmission system at Hilo, and, it being thought advisable to install a reserve steam power plant, the management decided, after a thorough canvass of modern steam power plant work, to install the following:

BOILER. Babcock & Wilcox Boiler.

ENGINE. 250 H. P. Tandem Compound Condensing McIntosh & Seymour Engine.

CONDENSER. One Independent Snow Air Pump and Jet Condenser.

HEATER. Vertical Goubert Feed Water Heater.

FEED PUMP. Snow Duplex Boiler Feed Pump.

STACK. Steel Stack and connections.

MISCELLANEOUS. Pipe and fittings, and various steam auxiliaries and appliances.

*Bulletin No. 51 with full particulars regarding the steam power plant of this installation will be furnished on application.*

# CONSOLIDATED CANAL CO.

MESA, ARIZ.



This Company is the owner of a large tract, some 30,000 acres, of the rich land around Mesa, Ariz., a small town near Phoenix. The Company owns an extensive system of water power and irrigation canals. They propose to raise beef cattle for the market. Heretofore they have been handicapped in their electric power work by low water, and the high grade steam plant described below, was selected to determine if they could profitably produce power with steam for the purpose of raising water for irrigation, for various parts of their tract. They have a central generating station, current being taken to sub-stations where electrically driven pumps are operated, to elevate water to the level required for that particular section.

This plant was contracted for in February, 1903, and will be put in operation this coming summer. The outcome will be watched with much interest for if successful, it will open a new and profitable employment for large sections of Arizona land having water available for irrigation by pumping.

The plant is perhaps the most complete and contains the highest grade equipment that has been installed in Arizona to date. It consists, in part, as follows:

BOILERS. Two Babcock & Wilcox Boilers of forged steel construction throughout.

ENGINE. Tandem Compound McIntosh & Seymour Engine arranged for operating 300 KW generators.

CONDENSER. Wheeler Admiralty surface condenser.

AIR PUMP. Edwards Independent steam driven crank and flywheel pump.

HEATER. Goubert Vertical Heater.

SEPARATOR. Stratton steam separator.

CIRCULATING PUMP. Wheeler Centrifugal pump.

VALVES. Chapman straightway, double seated, gate valves and Chapman valves throughout.

OIL SYSTEM. Complete equipment consisting of pumps, heater, automatic regulators, thermometers, etc.

MISCELLANEOUS. Various other special steam auxiliaries and appliances.

*Bulletin No. 47 with full particulars regarding the steam power plant of this installation will be furnished on application.*



# SACRAMENTO ELECTRIC, GAS & RAILWAY CO.

## SACRAMENTO, CAL.



This plant is noteworthy as being practically the first high grade economical steam plant installed on this coast as a reserve plant for electric power transmission. The electric plant at Folsom was one of the first started in this State, and due to periods of low water in the American River at a time when the power was most urgently required, it was found necessary to install this plant at Sacramento, the prime necessity being an engine that would stand a heavy overload.

The contract called for an engine of about 500 HP. capacity, at most economical load—yet in the daily operation of this engine time and again cards have been taken showing from 950 to 1000 HP. developed. The character of a number of the largest power plants that are installed on this coast as steam reserve for electric power transmission are directly traceable to the remarkable performance of this pioneer plant.

The steam plant equipment, in part, consists of the following:

BOILERS. Two Babcock & Wilcox Boilers.

ENGINES. 500 HP. Tandem Compound McIntosh & Seymour Engine with rope drive connection to a counter shaft, upon which are mounted the motors which receive their current from the Folsom electric power transmission system.

CONDENSER. Snow Jet Condenser.

SEPARATOR. Stratton Receiver Separator.

HEATER. Open Type Feed Water Heater and Filter.

FUEL OIL SYSTEM. Consisting of Snow Pumps, Heater, Etc., controlled by Spencer Regulator

FEED PUMPS. Snow Feed Pumps.

OIL PUMPS. Snow Oil Pumps.

MISCELLANEOUS. Various other steam auxiliaries, appliances, etc.

*Bulletin No. 46 with full particulars regarding the steam power plant of this installation will be furnished on application.*

## CENTRIFUGAL PUMPING PLANTS.



The publishers have made a specialty of centrifugal pumping plants and have designed and installed some of the largest and most modern on the Pacific Coast, prominent among which could be mentioned the following:

### BRITISH COLUMBIA GOVERNMENT.

For reclamation work on the Matsqui Dykes. Two plants having 30'' Centrifugal Pumps operated by Hamilton Corliss Engines, with Babcock & Wilcox Boilers. High-grade condensing outfits and equipment of auxiliaries and steam appliances.

### ARCHIE BORLAND.

MENDOTA, CAL.

Twenty-six-inch Centrifugal Pumping Plant operated by Hamilton Corliss Engine, with Babcock & Wilcox Boiler. High-grade condensing outfit and equipment of auxiliaries and steam appliances.

### MIDDLE RIVER NAVIGATION & CANAL COMPANY.

STOCKTON, CAL.

This plant has many novel features. The main Pump is a 26'' Centrifugal, direct connected to compound Ideal Engine, with special governing feature providing automatic regulation under all conditions of head and loads due to variations in height of water. Steam is furnished by Semi-marine Babcock & Wilcox Boiler (steel cased). Wheeler condensing apparatus and very complete equipment of auxiliaries and steam appliances used. This plant is installed on a wooden barge, providing a floating pumping plant for operation at different places on the river or sloughs, permitting plant to be used either for irrigation, drainage or fire purposes. It is considered that the equipment of the Middle River Navigation & Canal Company is the most complete and economical of its kind that has yet been installed on this Coast.

*Photographs or descriptive matter of any of the above plants will be mailed to interested parties on application.*

## ADDITIONAL.



Among many other prominent corporations, firms and individuals on the Pacific Coast for whom complete or partial plants have been installed, the publishers refer to the following:

Atlantic Gulf and Pacific Co.	-	-	-	-	San Francisco
Stauffer Chemical Co.	-	-	-	-	San Francisco
Giant Powder Co., Consolidated	-	-	-	-	San Francisco
Hebrew Orphan Asylum	-	-	-	-	San Francisco
Examiner Building	-	-	-	-	San Francisco
Gaston Ridge Mining Co.	-	-	-	-	San Francisco
Spring Valley Water Works	-	-	-	-	San Francisco
Pacific Power Co.	-	-	-	-	San Francisco
San Francisco Gas & Electric Co.	-	-	-	-	San Francisco
San Francisco Brewing Co.	-	-	-	-	San Francisco
California Wine Association	-	-	-	-	San Francisco
Buckingham & Hecht	-	-	-	-	San Francisco
Sutro Railway Co.	-	-	-	-	San Francisco
Lane Hospital	-	-	-	-	San Francisco
St. Francis Hotel	-	-	-	-	San Francisco
Eureka Glue Works	-	-	-	-	San Francisco
Ferry Building	-	-	-	-	San Francisco
Legallet Hellwig Tanning Co.	-	-	-	-	San Francisco
Pacific Power Co.	-	-	-	-	San Francisco
Oakland, San Leandro and Haywards Elec. Ry. Co.	-	-	-	-	Oakland, Cal.
Oakland Transit Co.	-	-	-	-	Oakland, Cal.
Anson Blake	-	-	-	-	Oakland, Cal.
Oakland Gas, Light and Heat Co.	-	-	-	-	Oakland, Cal.
Alameda, Oakland and Piedmont Ry. Co.	-	-	-	-	Alameda, Cal.
Cal. Institute Deaf, Dumb and Blind	-	-	-	-	Berkeley, Cal.
University of California	-	-	-	-	Berkeley, Cal.
Borland Pumping Plant	-	-	-	-	Mendota, Cal.
Solano Electric Light and Power Co.	-	-	-	-	Benicia, Cal.
Kullman, Salz & Co.	-	-	-	-	Benicia, Cal.
Consolidated Light and Power Co.	-	-	-	-	Redwood City, Cal.
Vallejo Electric Light and Power Co.	-	-	-	-	Vallejo, Cal.
Ventura Land and Power Co.	-	-	-	-	Ventura, Cal.
San Diego Brewery	-	-	-	-	San Diego, Cal.
San Diego Electric Railway Co.	-	-	-	-	San Diego, Cal.
Mare Island Navy Yard	-	-	-	-	Mare Island, Cal.
Mountain Copper Co.	-	-	-	-	Keswick, Cal.
Dutch Mining and Milling Co.	-	-	-	-	Jamestown, Cal.
Vacaville Water & Light Co.	-	-	-	-	Vacaville, Cal.
Western Beet Sugar Co.	-	-	-	-	Watsonville, Cal.
W. T. Reid, Belmont School	-	-	-	-	Belmont, Cal.
Oxnard Construction Co.	-	-	-	-	Oxnard, Cal.
Hotel del Coronado	-	-	-	-	Coronado Beach, Cal.
San Joaquin Power Co.	-	-	-	-	Fresno, Cal.
Cal. & Hawaiian Sugar Refining Co.	-	-	-	-	Crockett, Cal.
Middle River Navigation and Canal Co.	-	-	-	-	Stockton, Cal.
Sawyer Tanning Co.	-	-	-	-	Napa, Cal.
Eagle Shawmut Mining Co.	-	-	-	-	Chinese, Cal.
Temescal Water Co.	-	-	-	-	Corona, Cal.

# ADDITIONAL.—Continued.

Cal. Vigorit Powder Co.	-	-	-	-	Point Isabella, Cal.
Distilled Ice & Cold Storage Co.	-	-	-	-	Los Angeles, Cal.
Los Angeles Traction Co.	-	-	-	-	Los Angeles, Cal.
Edison Electric Co.	-	-	-	-	Los Angeles, Cal.
Los Angeles Paper Co.	-	-	-	-	Los Angeles, Cal.
Los Angeles & Pacific R. R. Co.	-	-	-	-	Los Angeles, Cal.
Los Angeles Railway Co.	-	-	-	-	Los Angeles, Cal.
Redlands Electric Light & Power Co.	-	-	-	-	Redlands, Cal.
Bisbee Improvement Co.	-	-	-	-	Bisbee, Ariz.
Gordon McLean	-	-	-	-	Morenci, Ariz.
Phoenix Railway Co.	-	-	-	-	Phoenix, Ariz.
Phoenix Light & Fuel Co.	-	-	-	-	Phoenix, Ariz.
Phoenix Water Co.	-	-	-	-	Phoenix, Ariz.
Ashland Light & Power Co.	-	-	-	-	Ashland, Or.
Oregon Water Power & Railway Co.	-	-	-	-	Portland, Or.
University of Utah	-	-	-	-	Salt Lake City, Utah.
Puget Sound Naval Station	-	-	-	-	Bremerton, Wash.
Everett Pulp & Paper Co.	-	-	-	-	Everett, Wash.
Everett Electric Ry. Co.	-	-	-	-	Everett, Wash.
Cascade Steam Laundry	-	-	-	-	Seattle, Wash.
Seattle Electric Co.	-	-	-	-	Seattle, Wash.
Seattle Brewing & Malting Co.	-	-	-	-	Seattle, Wash.
Tacoma Smelting Co.	-	-	-	-	Tacoma, Wash.
Washington Agricultural College	-	-	-	-	Pullman, Wash.
Vancouver Electric Light & Power Co.	-	-	-	-	Vancouver, Wash.
Ballard Electric Co.	-	-	-	-	Ballard, Wash.
British Columbia Government (Pumping Plants for Matsqui Dykes)	-	-	-	-	British Columbia.
Appolo Consolidated Mining Co.	-	-	-	-	Unga Is., Alaska.
Northwest Light & Power Co.	-	-	-	-	Skaguay, Alaska.
Chas. S. Desky	-	-	-	-	Honolulu, H. T.
Castle & Cook, Ltd.	-	-	-	-	Honolulu, H. T.
Hackfield & Co.	-	-	-	-	Honolulu, H. T.
American Sugar Co.	-	-	-	-	Honolulu, H. T.
Kahuku Plantation	-	-	-	-	Honolulu, H. T.
Waialulu Agricultural Co.	-	-	-	-	Honolulu, H. T.
Ewa Mill	-	-	-	-	Honolulu, H. T.
Ewa Plantation	-	-	-	-	Honolulu, H. T.



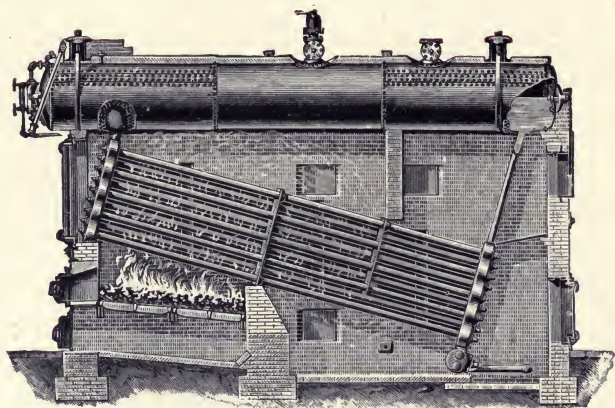
*The following pages illustrate our  
leading lines of high grade ma-  
chinery which we unreservedly offer  
as the "first choice of the engineer."*

*CHAS. C. MOORE & CO.,  
Engineers.*

## THE BABCOCK & WILCOX PATENT WATER-TUBE BOILERS.



We learn quite as much through the record of failures as through the results of success. When a thing has been once fairly tried and found to be impracticable or imperfect, the knowledge of that trial forms a beacon light to those who come after, not to run upon the same rock. Still it is an every-day occurrence that a device is brought up as a great improvement upon other things which have proved by their survival to have been the fittest. This is particularly the case when a person or firm have, by long experience, succeeded in supplying a felt want, and developed a business which promises to repay them in the end for their trouble and outlay. Immediately a class of persons who desire to reap where they have not sown rush into the market with something similar, and generally with some idea which the successful party had tried and discarded, claiming it as an improvement, and seek to entice customers,



who in the end find they have spent their money for that which satisfieth not. And not infrequently steam users, having been inadvertently induced to experiment on the ill-digested plans of some inventor, unjustly condemn the whole class, and resolve henceforth to stick to the things their fathers approved.

The success of the Babcock & Wilcox Boiler is due to many years' constant adherence to one line of research, experimenting and practical working.

Since its introduction there have been more than thirty water-tube or sectional boilers put upon the market by other parties, a few of which attained to some distinction and sale, but all of which have completely disappeared, leaving scarcely a trace behind, save in the memories of their victims.

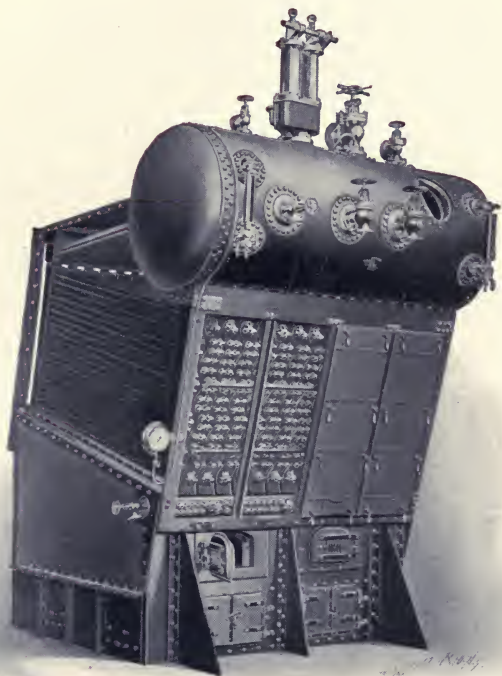
It is with the object of protecting customers and friends from disappointment and loss through such discarded ideas that these experiments, made in the development of the present Babcock & Wilcox Boiler, are spoken of, the value and success of which are evidenced by the fact that the largest and most discriminating buyers continue to purchase them after years of practical experience with their working.

*The book "Steam" descriptive of above  
will be furnished free on application.*

## THE BABCOCK & WILCOX MARINE WATER-TUBE BOILERS.



The marine engineer of to-day, conversant with the current literature of his calling, is no longer in doubt regarding the position of the water-tube boiler for marine purposes. He is not only convinced that it has come to stay, but



is equally sure that it will at no late date supplant the boilers of the fire-tube variety in all important steamers on lake and sea.

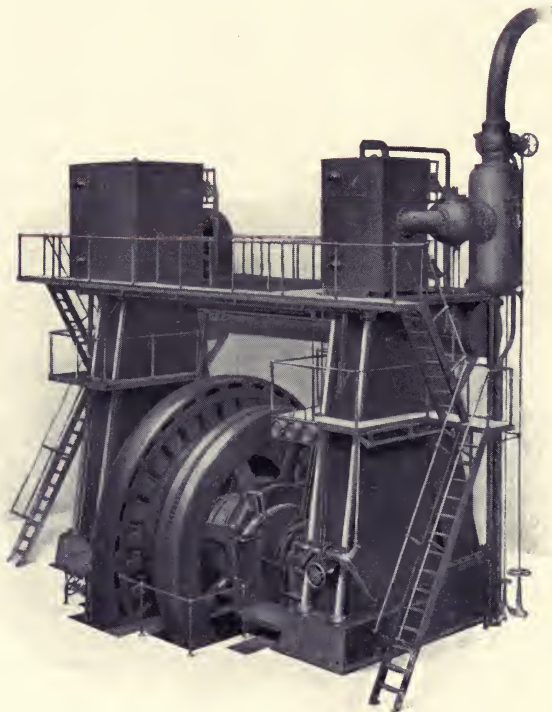
The construction of the Babcock & Wilcox Marine Boiler embodies the same well-known principles as the successful land or stationary type, freedom of circulation and economy when forcing being important factors of both designs.

*The book "Marine Steam" descriptive of  
above will be furnished free on application.*

## McINTOSH & SEYMOUR ENGINES.



These engines are built in many different styles, but no matter for what service they are intended, but one grade is built—the highest. The fact that many of the most prominent central stations, power plants, lighting plants, office buildings, clubs and hotels have adopted these is sufficient proof of their work.



The true measure of the success of these engines, and of the quality of the workmanship and materials used in their construction, is the number of them that have been sold, and the increase in this number for each year.

Following are the different styles, types and services to which these engines have been put: Mill engines, lighting engines, and electric railway engines, built, simple, compound, triple expansion, horizontal, vertical, tandem and cross, either direct connected or belted types. Special engines to meet special requirements.

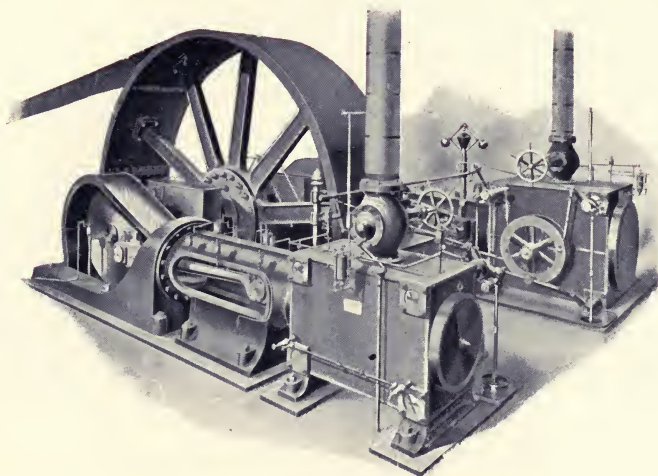
*Special catalogue descriptive of  
the above free on application.*



## HAMILTON CORLISS ENGINES.



The workmanship and materials used in the building of Hamilton Corliss Engines, are first-class in every particular. All forgings are of best open hearth steel or hammered iron. Castings subject to wear are made of special iron and great care is taken to make all castings of the best quality. Engines are made to gauge, so that all parts will be interchangeable.



This is not introducing a new or untried type of apparatus, but simply bringing to your attention a Corliss Engine, constructed in accordance with the best engineering practice and embodying in its designs all such improvements as years of experience have suggested. An engine which is reliable under the most severe tests.

From the foundry to the erecting room the best skill is used in this engine's manufacture, and when it reaches the erecting room, it is ready for immediate and continuous duty as its final resting place.

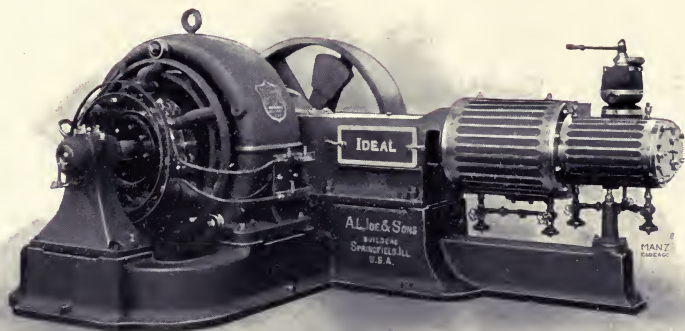
*Special catalogue descriptive of  
above sent free on application.*

## IDEAL STEAM ENGINES.



Simplicity, the central idea in the design and the examination of an Ideal engine, enforces the conviction that this idea has been wrought successfully into form, giving an engine which is matchless in simple, direct, substantial construction.

These are the elements needed in an engine built for business. Among the many features which gives distinction to the Ideal engine, accessibility to all working parts and the ease of making adjustments deserve mention.



The Ideal engine is known the world over as the "self-oiling engine." It is the first engine in which the oiling of all working parts has been brought under a comprehensive system in which there is a constant distribution and return of the oil on the circulatory principal.

All Ideal engines embody the Ideal self-oiling system which is covered by letters patent granted to Albert L. Ide, and to this feature is due not a small share of the success and popularity of this engine.

This system is as constant as the action of mass and molecular gravitation upon which it depends. It uses no moving mechanism which can wear out or become deranged, but merely brings into co-operation for the performance of this special function, the inherent forces already at play within the engine.

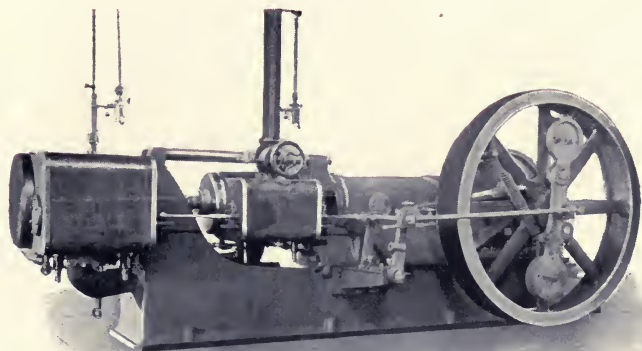
*Special catalogue descriptive  
of this free on application.*

## PHOENIX AUTOMATIC CUT-OFF ENGINES.



If there is one requirement more than another essential in the high-speed engine for electric work, it is absolute reliability and readiness for service at all times and under all conditions.

Economy of fuel is also a matter of prime importance, but it should be considered that the best economy is not that which is shown at the preliminary test when the engine is new, but rather that which can be maintained year after year under the conditions of service. It must be economy that does not disappear after a year or two, as the result of leaky valves, badly worn surfaces and heavily increased friction. These engines are simplified as far as possible. No



other high-speed engine on the market contains so small a number of working parts.

The merit of any engine is shown not so much by the performance of a single plant under favorable conditions, and nursed by a trusty engineer as by the average of a number of engines under all the conditions, good, bad and indifferent, of actual service.

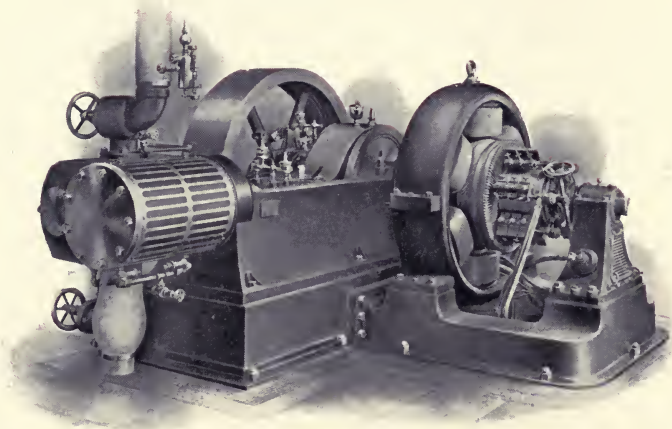
It was to meet these conditions that the Phoenix Automatic Cut-Off Engines were designed and constructed, and, as evidence of their success, after building numbers of high-speed engines for a long term of years, it is possible to refer to any engine that has been sent out and to every customer to whom they have been sold. There is not one as far as known, from whom a handsome testimonial cannot be obtained.

*Special catalogue descriptive of  
above sent free on application.*

## THE NEW YORK SAFETY ENGINES.



During the period which the manufacturers of the New York Safety Engine have devoted to engine building over 6,000 engines of their construction have been sold and are to-day at work. They comprise a great variety of types and sizes, they building both horizontal and vertical engines for stationary



work, and upright engines for marine work, all told more than 100 patterns differing in either style or size.

They have always sold their productions at their merits—first-class goods at reasonable prices. Being well designed, well built and reliable, they have become well known and popular throughout the world. Their future policy will be strictly in line with their past history. It has been their constant aim to produce the best steam engines in the market.

*Special catalogue descriptive of  
above sent free on application.*

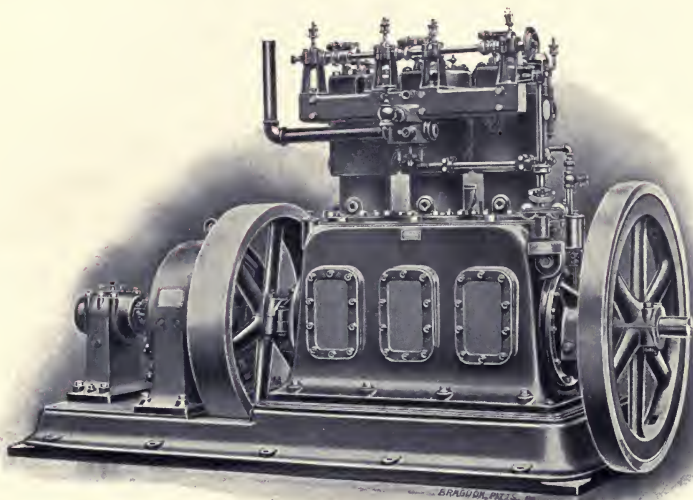


## WESTINGHOUSE GAS AND OIL ENGINES.



The Westinghouse Gas Engine is the pioneer of gas engines in large units, they having through the past few years practically demonstrated the fact that the same dependence can be placed on this source of power as was heretofore only to be secured from the better types of steam machinery.

To-day Westinghouse gas engine plants are in evidence with units as large as 1500 B. H. P., and totaling in many installations several thousand horsepower; in vertical, horizontal, single and double-acting types, and meeting the requirements of the most difficult classes of service.



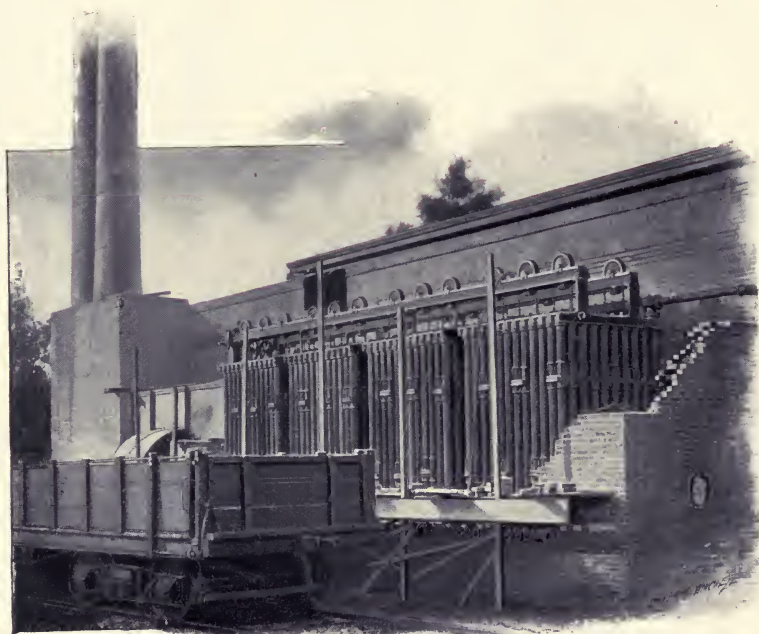
Plants are operating for electric light, power and railway service, in office buildings and industrial establishments throughout the United States, and in connection with various classes of fuels and gas processes. Much of the success achieved by these engines is unquestionably due to superior design and construction of such parts as the cylinders, pistons, connecting rods, crank shafts, bearings, etc., while moderate costs for complete equipments, as compared with any other known source of power, have created a tremendous growth in this department.

Westinghouse gas and oil engine plants are installed complete on a basis of absolute guarantees for any service, and for use in connection with the Dowson, Taylor, Mond, Loomis Pettibone or other producer gas systems, natural gas, illuminating gas, gasoline, distillate, and the Chas. C. Moore & Co's crude oil system.

*Special catalogue descriptive of  
above sent free on application.*

## GREEN'S PATENT FUEL ECONOMIZERS.

It is a recognized fact that the most economical boilers are those which have the most rapid circulation, and to obtain this circulation the temperature of the escaping gases must leave the boiler considerably above the temperature of the steam. What this ratio should be to obtain the highest economical results is a subject on which engineers differ very widely. With the high pressure now in use, and gradually increasing, the temperature of the gases increases in proportion to the temperature of the steam generated, and thus the necessity of economizers becomes greater to utilize this heat.



The advantages of an economizer may be summed up as follows:

Saving from ten to twenty per cent in fuel. Heating the feed water economically to high temperatures, considerably above what can be obtained by other means. A great volume of water always in reserve at the evaporative point, ready for immediate delivery to the boilers. Utilizing in a practical way heat from the escaping gases which otherwise would go to waste. Prolonging the life of boilers by high temperature of feed water, preventing the usual expansion and contraction. Considerable sediment in the feed water being deposited in the economizer (whence it can easily be blown off) by reason of slow circulation and high temperature obtained. Increasing the boiler efficiency by adding to its heating surface.

*Special catalogue descriptive of the  
above will be sent free on application.*

# MINING MACHINERY.

## THE HOLTHOFF MACHINERY COMPANY, CUDAHY, WISC.



This Company's experience in designing milling and metallurgical machinery, and in designing complete plants, has extended over a period of many years, and this experience, together with the fact that they are in close touch with eminent metallurgists, places them in a position to supply their customers with machinery of the latest and most improved type, and with plans for its installation in accordance with up-to-date and practical methods of handling ore so as to obtain the best commercial as well as metallurgical results.

To withstand the hard usage to which mining and reducing machinery is subjected, it must be constructed of material suitable for the work it is to perform. It is known by practical experience what this means to the purchaser



frequently located many miles from the railway connection, and it is their purpose to build only the best and most substantial

This Company builds machinery for stamp mills, chlorination mills, cyanide mills, concentration and combination mills, sampling works, silver-lead, copper and pyritic smelting works, copper bessemerizing plants, mine equipments, boilers, and all kinds of heavy sheet metal work, hoisting engines, blowing engines, and transmission machinery.

Special care used in boxing and packing machinery for mule-back transportation; no packages to weigh more than 300 pounds, and whenever possible, only 150 pounds.

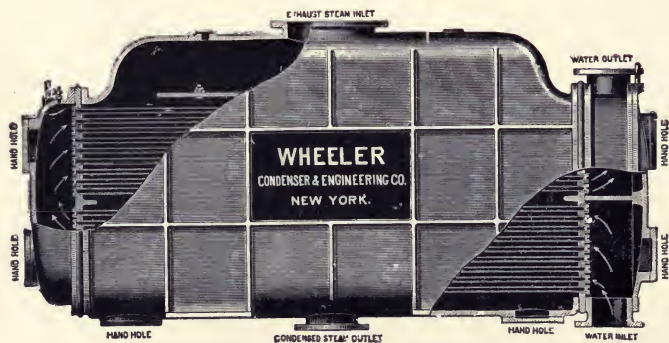
Particular attention will be given to building machinery and making plans to meet special conditions, and to carry out the ideas of progressive metallurgists.

*Special catalogue descriptive of the  
above will be sent free on application.*

## WHEELER ADMIRALTY SURFACE CONDENSERS.



The surface condenser is the modern development of the jet condenser, so called from the introduction of a jet or spray of cold water into a closed vessel, from which the air has been exhausted, in intimate contact with the exhaust steam, thus causing the same to be condensed in the surface condenser; the result is obtained without commingling the exhaust steam and circulating water, so that the latter may be alkaline, salt, muddy, or impregnated with impurities, without affecting the quality of the condensed steam.



Wheeler condensers are made either cylindrical or rectangular in shape. The improved rectangular is strongly recommended, owing to a special arrangement for reducing the velocity of the steam, together with a large storage capacity, an extremely desirable feature in connection with large units, such as are encountered in electric light and power stations, rolling mills, blast furnaces, dredges, etc., where sudden and variable loads are to be provided for.

Wheeler condensers built of capacities ranging from 25 H. P. to 10,000 H. P., to suit all conditions and specifications. Shells of cast iron, steel, copper or brass will be furnished when desired.

*Special catalogue descriptive of the above will be sent free on application.*



## BARNARD WHEELER COOLING TOWERS.



With the advent of the cooling tower the advantages to be gained from running "condensing" are placed within the reach of every steam user. Its function is to cool the circulating water, so that it may be used over and over again in the condenser.

The introduction of the Barnard Wheeler Fanless Self-cooling Water Towers brings into play all the desirable features of the Barnard Tower Fan Type, but dispenses with the use of fans for creating a draught, and consequently eliminates a constant source of expense, viz: the power necessary to run them.

The field into which this device enters is almost boundless. A mining or any steam plant located where water and coal are hauled or conveyed in an expensive manner, is practically compelled to run non-condensing unless resort is made

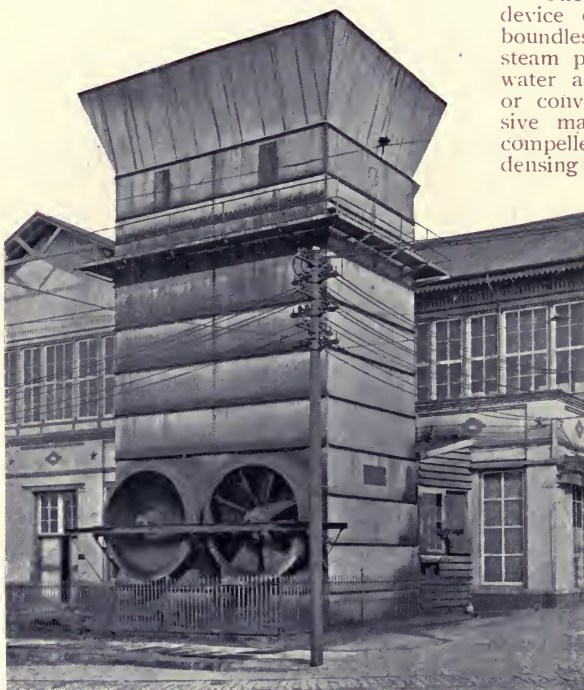
to the cooling tower, when all the economy of a condensing system is gained at a comparatively small cost.

Power house location is greatly simplified. Those which have been placed in remote positions necessitating long lines of wiring, liable to serious leaks, say nothing of the additional cost of copper feeders, may with the installation of the Barnard tower be located centrally.

The same argument applies to artificial ice factories. Breweries have long known the importance of such a device. In general, all steam users will recognize in the Barnard Wheeler Self-cooling Water Towers positive and immediate money savers.

A common reduction of temperature by the use of these towers has been from say 130 degrees to between 85 and 90 degrees, and when it is remembered that this is accomplished simply by nature's functions, the magnitude and importance of this invention is strongly accentuated.

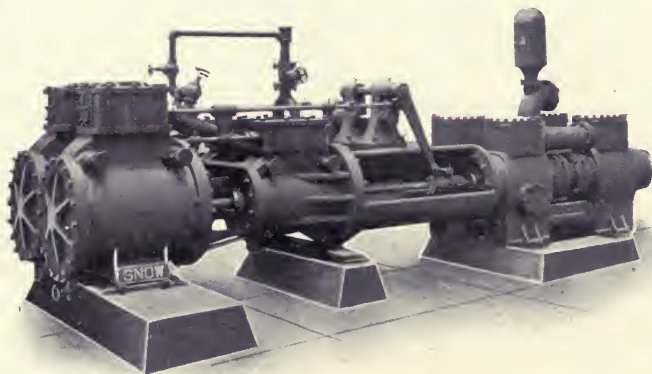
*Special catalogue descriptive of the  
above will be sent free on application.*



## SNOW STEAM PUMP.



The Snow Steam Pump is of the duplex pattern, consisting of two direct acting engines and two double acting pumps, so coupled that the steam piston of one actuates through the medium of the vertical lever the steam valve of the other. The advantage of this valve motion is obvious. As one of the steam valves must always keep open, the pump may be started at any point in its stroke, thus making it impossible for the pump to be on a "dead-point." This arrangement also produces a smoothness and certainty of stroke that is not found in single cylinder pumps.



The speed of the piston as it moves toward the end of the stroke is reduced to a minimum; finally pausing an instant, it allows all water valves to seat, thereby obviating all possible shock, and producing a perfectly steady and uniform flow of water. This point is of great superiority; a pump that runs without jar or noise, from its minimum to its maximum speed, recommends itself for all work where the destructive jar of a single cylinder pump is objectionable.

Snow Pumps are built for almost every service where water, oil, gas, air, or any liquid is to be pumped, and especially water works pumping engines of any capacity to give the best efficiency.

*Special catalogue descriptive of the  
above furnished free on application.*

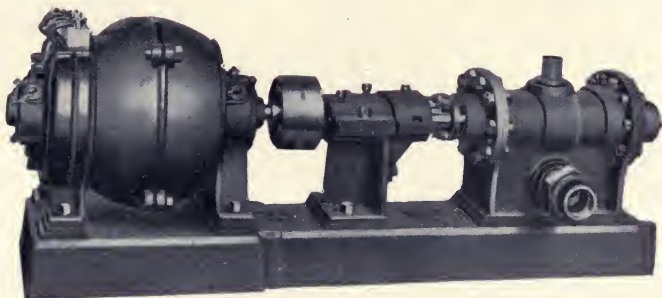
## QUIMBY SCREW PUMPS.



The general form and construction of the Quimby Screw Pump consist of four screws that act as pistons in propelling the water, they being mounted in pairs on parallel shafts, and are so arranged that in each pair the thread of the one screw projects to the bottom of the space between the threads of the opposite screws. The screw-threads have flat faces and peculiarly undercut sides. The width of the face and the base of the threads being one-half the pitch, the pump cylinder fits the perimeters of the threads, space enough being left between the screws and the cylinder and between the intermeshing threads to allow a close running fit without actual contact. There is no end thrust of the screws in the bearings, because the back pressure of the column of liquid is delivered to the middle of the cylinder, and the endwise pressure upon the screws in one direction is exactly counterbalanced by a like pressure in the opposite direction.

The advantages of the Quimby Screw Pump are as follows:

**Simplicity and durability.** Having no valves, no internal packing, and no small moving parts, there is very little opportunity for the pump to get out of



order, and as the screws are not in contact with the cylinders or with each other, the consequent absence of wearing surfaces gives the pump great durability. To appreciate the simplicity of the Quimby Pump it should be compared with other pressure pumps in common use, either of the duplex or triplex pattern, particularly in the case of electrically driven pumps.

**Efficiency.** These pumps have a very wide efficiency against a wide range of pressures, for the following reasons:

The power is applied direct; the thrust and the back pressure of the column of liquid in the delivery pipe is perfectly balanced; the absence of rubbing surface and consequent absence of internal friction; the rotary motion of all the moving parts, and the continuous flow of the liquid delivered.

**No pulsation.** As the action of the screws on the liquid is continuous, the delivery is free from pulsation. By thus keeping the liquid in constant and uniform motion the efficiency of the pump is increased, and the pump particularly suitable for certain specific purposes.

Precipitating and centrifugal pumps have a churning effect upon the liquids handled. This churning effect is avoided by the pulseless delivery of the Quimby pump.

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above will be sent free on application.*

## DEANE TRIPLEX POWER PUMPS.



The power pump differs from the direct driven steam pump in two principal features:

First—The speed of the plunger in a power pump is not uniform throughout the stroke, as the crank must necessarily move in a circle, while the plunger travels in a straight line. The velocity of the plunger, therefore, rapidly increases from the beginning of the stroke, is maximum at the center of the cylinder, and decreases from a point about three-quarters to the end of the stroke.

Second—The elasticity of the fluid handled by a power pump does not compensate for the vibration in the load, while in a steam pump any variation is easily cared for by the elasticity of the steam.



It is principally from these two facts that it has been found necessary to make use of the triplex design. In fact, the design and construction of a power pump requires years of experience with this particular class of machinery in order to assure a successful operation of the pump when installed. This fact has been demonstrated from the number of power pump wrecks, which is much greater than that of steam pumps.

The Deane Power Pump is the result of over thirty years' experience in the designing and constructing of power pumping machinery, and the 1900 pattern of the Deane Vertical Triplex Power Pump represents not only the best engineering, but also the best design, material and workmanship that has ever been put into a machine of this class.

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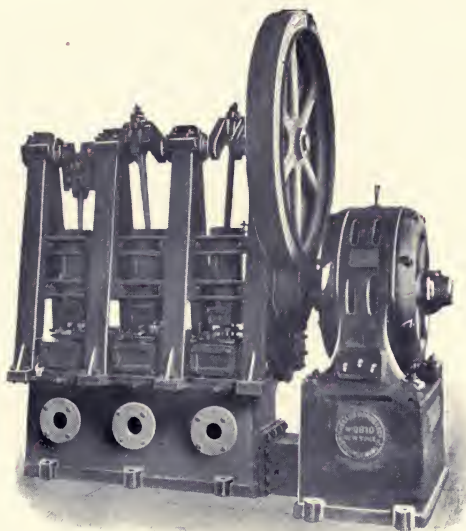


## THE EDWARDS PATENT AIR PUMPS.



The adoption of the Edwards Air Pump by so large a number of the leading marine engineers may be regarded as a "hall mark" of its reliability and efficiency. The great responsibility attached to his position naturally tends to make the superintendent engineer for a fleet of steamers somewhat reluctant to adopt any specialty until it has been subjected to, and has successfully emerged from the only really satisfactory test, viz: prolonged trials under actual working conditions at sea.

Up to this date the Edwards Patent Air Pump has been fitted to over 500



vessels, many of them twin screws, and the total number of pumps built or on order for marine and land purposes exceeds 1000. These facts speak for themselves, and show that engineers generally have realized the great advantages possessed by the Edwards Air Pump over the old type of pump fitted with foot and bucket valves.

The essential conditions of success, namely, simplicity of design and construction combined with a very high standard of efficiency, are embodied in the Edwards pump. A brief description of its leading features and advantages would be appreciated by all those whose interests lie either in increasing the efficiency of their engines and thereby reducing their annual coal bill, or in maintaining a reputation for building engines which, together with their accessories, are economical, efficient, and thoroughly reliable.

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## GOUBERT FEED WATER HEATERS.



The Goubert Feed Water Heater as illustrated herewith, shows in its latest construction the result of the best engineering experience in the utilization of exhaust steam.

The feed water admitted at the bottom proceeds directly through the tubes into the boiler, while exhaust steam taken into shell outside the tubes heats the feed water to the highest degree possible through the use of exhaust steam.



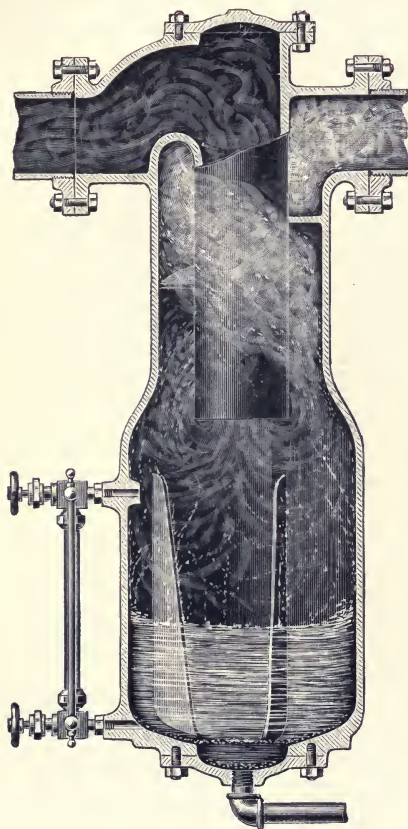
Every one who has any knowledge, theoretical or practical, of the use of steam will readily admit the desirability of employing some apparatus by which the water can be heated before it is admitted to the boiler. The capacity of the boiler is therefore not only much increased, but the immense strain to which its structure is subjected by the sudden and violent changes in temperature that follow the admission of cold water is entirely obviated, adding largely to its life and usefulness.

If, as in the case of the Goubert Heater, it can also be shown conclusively that it is possible to raise the temperature of the feed water to 210 and 212 degrees Fahrenheit by the use of exhaust steam that would otherwise go to waste, the advantages of such an arrangement become too obvious to require further argument.

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## THE STRATTON SEPARATORS.

The Stratton Separator is based on the principle that if a rotative motion is imparted to the steam, all the liquid particles it may contain, being heavier than the steam, acquire centrifugal force and are projected to the outside of the current.



The current steam on entering the separator is deflected by a curved partition and thrown tangentially to the annular space at the side near to the top of the apparatus. It is thus whirled around with all the velocity of influx, producing the centrifugal action which throws the particles of water against the outer cylinder.

These adhere to the surface, so that the water runs down continuously in a thin sheet around the outer shell into the receptacle below, while the steam following in a spiral course to the bottom of the internal pipe abruptly enters it, and in a now dry condition passes upward and out of the separator water, all danger of the steam taking up again such water after separation, being entirely avoided.

As the rapid rotation of the current of steam also imparts, to the separated water, a whirling motion, which tends to interfere with its proper discharge from the apparatus, the separator has been provided with wings or ribs projecting inwardly at an acute angle to the course of the current, thus breaking up this whirling motion and allowing the water to settle quieting at the bottom, whence it passes off through the drain pipe.

The Stratton Separator has bowl or receiver capacity of from two to five times more than any similar device of its kind.

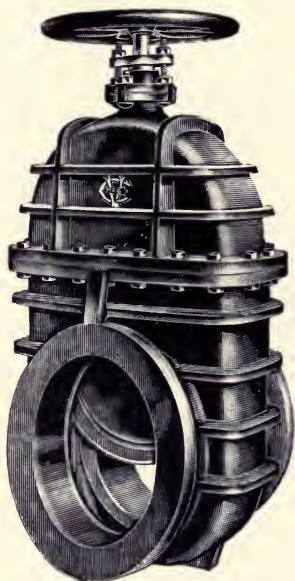
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## CHAPMAN VALVES AND FIRE HYDRANTS.



The Chapman Valve Manufacturing Company is the oldest and largest manufacturer of solid wedge gate valves in the United States, and their shops are now the largest and most thoroughly equipped in existence devoted to the manufacture of valves. The product consists of valves and fire hydrants and their accessories for all purposes.

The Chapman Gate Valves are of the double faced solid wedge plug type, and have a straightway passage the full diameter of the connecting pipe. This is the simplest and strongest design for the purpose; it requires the smallest



number of working parts and offers the least resistance to the passage of the fluid. They are made in all sizes, from one-quarter inch upward, in both straight and angle pattern, for all kinds of liquids and gases, for any pressure desired, and of materials best adapted to resist the action of the substances to be held.

Before leaving the works every valve is tested, both opened and closed, under a pressure sufficient to ensure its tightness under all working conditions.

The Chapman Valve Company's shops are fitted with the most improved machinery, specially designed for this work. All parts of the valves are made to steel gauges, and to a large extent are perfectly interchangeable. The workmanship is of the best in every particular.

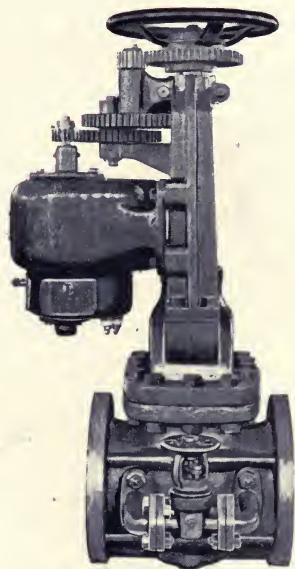
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## ELECTRICALLY OPERATED CHAPMAN VALVES.

With the steadily increasing application of electricity to all kinds of machinery a large demand has arisen for valves to be operated by electric motors. The merits of the electric motor as a means of supplying power for a multitude of purposes, and the ease with which Chapman valves can be operated, making them particularly adapted to operation with the electric motor, have led the Chapman Valve Manufacturing Company to adopt this method of operating valves and sluice-gates.

These valves have been carefully designed. They retain the general features of excellence which distinguish all valves of Chapman manufacture, and which contribute to their uniform success. In addition they contain the latest



and most improved ideas in valve construction, are designed by experienced engineers, built by skillful workmen, and only the highest grade of material enters into their construction.

They are intended to withstand hard usage, and the design may be readily modified to meet special requirements. The compactness and simplicity in construction of the patented arrangements make it possible to use a very small motor for the operation of these valves. However, the motors are amply large to open the valves under all conditions, and in closing there is no danger of forcing valves to the seats so tightly but what they can be easily opened without the intervention of hand power.

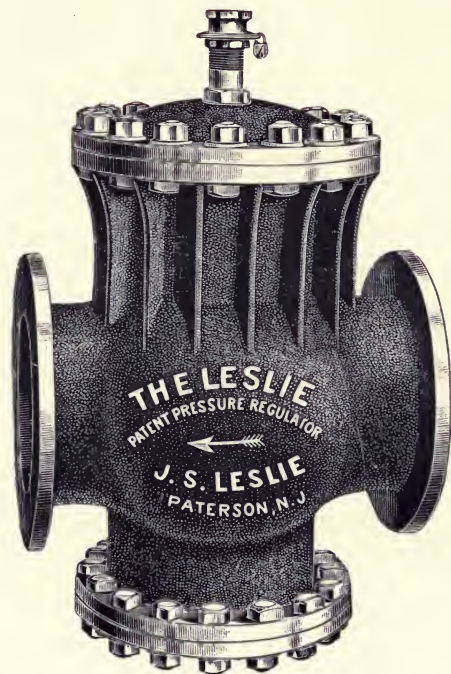
It is felt in presenting such apparatus that the Chapman Valve Manufacturing Company are the first to successfully design and construct valves operated entirely by electricity.

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## THE LESLIE PATENT PRESSURE REGULATORS.



Unknown to all except those who have used the Leslie Pressure Regulator, engineers prominent in designing and operating in every branch of Steam Engineering, knowing all the attempts which have been made to produce a successful pressure regulator, and, having witnessed their failure, had been convinced that these efforts had made a futile task until the Leslie Pressure



Regulator had, beyond a possible doubt in all conditions of service, proved its unparalleled success in every branch of steam engineering.

The Leslie Pressure Regulator has been in general use in the hardest kinds of service for several years, during which time it has been subjected to the most severe tests that occur in practice, and has withstood the most crucial and searching tests that any regulator has ever been subjected to.

All parts of every size regulator of every class are made from templates, thus making them interchangeable.

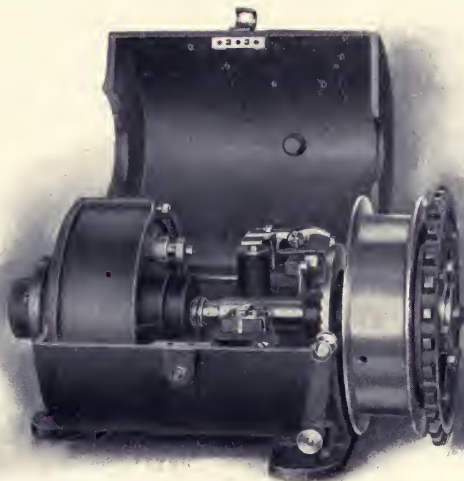
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## THE MONARCH AUTOMATIC ENGINE STOP SYSTEM.



The "Monarch System" is a system of automatic devices for use in steam and electric plants, and is designed to add to their efficiency and economy of operation and maintenance, and finally to furnish that absolute security against accident which is to be had by no other means.

The "Monarch System" entire consists of four units—that is, the Engine Stop for automatically closing down the engine in cases of emergency; the Special Limit for automatically preventing an excessive speed of an engine; the Vacuum Valve for automatically opening communication between the interior of the condenser and the atmosphere; and the Circuit Breaker Trip for auto-



matically tripping the circuit breaker in cases where generators are operated in multiple; each device performing its functions automatically, when the necessity arises, and the whole constituting a system that absolutely insures the safety and integrity of the plant under all operative conditions and at all times.

The "Monarch System" is now in use in the largest plants in the country, and has the unqualified endorsement of the leading engineers. Not only is it urged as a wise precautionary measure, but it is essentially the most modern and highly perfected method of maintaining the power end of a plant at the highest point of safety and efficiency; and when it is remembered that the power is the life-blood of the plant, the great importance of the subject may be fairly estimated.

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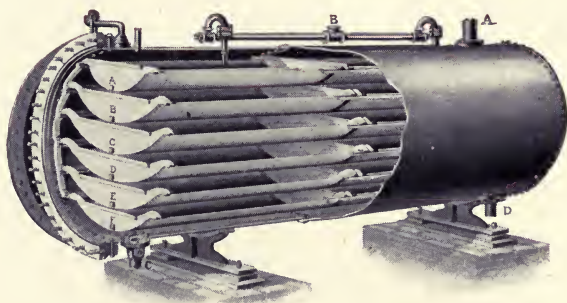
## HOPPE'S FEED-WATER HEATERS AND PURIFIERS.



The designer of the Hoppes Live Steam Feed-Water Purifier and Exhaust Steam Feed-Water Heater took from nature the principle on which the operation of the machine is mainly based.

Observing the formation of stalactites in natural caves he conceived the idea of applying the same principle in a machine for the purification of water for boiler purposes.

Many methods suggested themselves, but the trough-shaped steel pans were adopted as being the simplest and most efficient. The pans are so formed that the water runs over their edges and flows in a thin film along their undersides to the center before dropping into the pans below.



As the steam enclosed in the shell comes in contact with the thin film of water, the solids held in solution are separated and adhere to the bottoms of the pans in the same manner that stalactites form on the roof of natural caves.

Before the discovery of this principle the purification of water holding sulphates in solution was regarded as impracticable; now, no first-class plant in the lime districts is considered complete without a Hoppes Purifier, and many have both the heater and purifier.

The Hoppes Live Steam Feed-Water Heaters and Exhaust Steam Feed-Water Heaters are manufactured under the protection of patents which cover the principle and modified forms of trough, pans, plates, etc., of such construction that the lime and scale-making solids form on their under sides, as stalactites form on the roof and sides of natural caves.

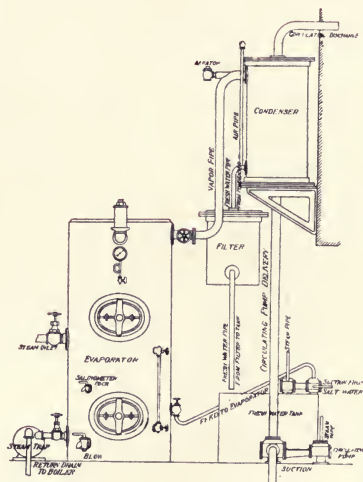
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## REILLY (QUIGGINS) PATENT EVAPORATORS.

The formation of scale on the heating surfaces of boilers was always objectionable, and in former days, when salt-water feed was used, the removal of scale was a tedious and disagreeable task. With the advent of high pressures now common, scale on heating surfaces is very dangerous, and renders the use of sea-water for "make-up feed" entirely inadmissible.

It is necessary, however, to have some provision to replace the losses which occur at many places, such as defective joints in boilers or pipes, leaky stuffing



boxes, etc. Even in the best marine plants there is some loss. A fair average requirement for a plant in ordinary good condition is about three tons of auxiliary feed-water per twenty-four hours for each 1000 H. P. of the machinery.

There are two ways in which the fresh water needed can be supplied—the storage of a supply in special tanks or double bottoms, and distillation for sea-water. The former has the objection of increasing the displacement of the vessel, and is only applicable, as a rule, in vessels making regular trips between the large ports. The latter, when properly arranged, makes ample provision as long as there is coal to raise steam. It has further the great advantage of providing absolutely pure water for drinking purposes, which is a specially valuable feature for naval vessels, yachts, etc., which go to all parts of the world.

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# INDUSTRIAL WATER PURIFYING AND SOFTENING APPARATUS.



The advantages of soft water are:

Boilers are kept free from scale and corrosion.

Waste of coal is avoided.

The expense of removing scale is eliminated.

Tubes and crown sheets do not require renewal.

Boilers are kept in continuous service and at high efficiency.

The life of the boiler is more than trebled.



Every ounce of scale forming calcium and magnesium salts contained in the water to be evaporated must be removed before the water is converted into steam, either by purification outside boiler, as in our process, or as scale within the boiler. Every ounce of scale deposited in the boiler must be removed by some vigorous chemical or mechanical means. Either method is likely to injure the boiler, and where the latter method is employed the expense for labor is not inconsiderable, to say nothing of the increased boiler capacity required when it is necessary to put boilers out of commission at frequent intervals for cleaning and repairs.

By the Industrial process, perfect feed water may be obtained from almost any kind of raw water at an expense of from two to five cents per thousand gallons.

There is no question as to the cheapest method of getting the scale-forming material out of the water.

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## THE STEAM LOOP AND HOLLY GRAVITY RETURN SYSTEM.



The Steam Loop and Holly Gravity Return System, for convenience spoken of as the "System," is an arrangement of piping that returns all water of condensation from steam pipes to boilers automatically and continuously.

Wherever water collects from steam condensation, in mains or secondary piping, in cylinder jackets, in reheaters, in dry kilns, or steam kettles, or heating systems, no matter where, or when, or how, the "System" diverts it from where it may do harm, and automatically delivers it back to the boilers from which it came. This it does without intermission, while pressure is maintained whether or not the boilers are delivering power. It does not wait for the water to collect, and then either drain it to waste or perhaps to a hot well, from which a part of it finally reaches the boilers, oily and minus a large store of valuable heat, but quietly and without interruption, without the aid of feed pumps or other moving parts, it maintains a circulation that returns the water to the boilers without oil and with practically all its heat.

It is simple in construction, has no moving parts, is continuous, rapid and positive in action, and of the highest possible efficiency and economy in operation.

It is applicable either before the steam is used, as at the throttle of the engine, or after the steam is used, as in returning the condensed water from the jackets, coils or tanks.

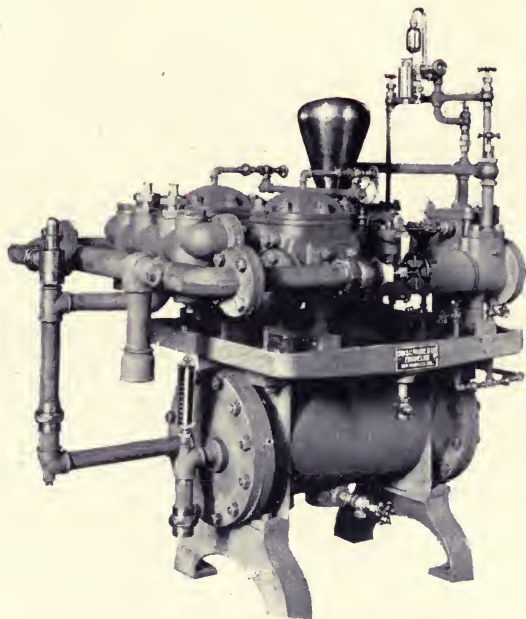
It secures dry steam, dispenses with steam traps and pumps, saves coal, water and oil, and gives protection against damage to costly steam machinery from water in cylinders.

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## CHAS. C. MOORE & CO'S FUEL OIL PUMPING SYSTEM.



The purpose of this system is to deliver oil under a constant pressure to the burners with the old storage tanks being mounted below the level of the grates, in accordance with the rules established by the underwriters, the system drawing the oil from the storage tanks, heating it by means of exhaust steam to the required temperature for its proper atomization, straining from the oil all foreign material which may clog the burners, and delivering it to the burners at a uniform pressure, regardless of the amount of oil being used by them. The



system is at all times under control of the operator, and is specially adapted to handle the heaviest grades of California oil with the greatest economy.

The successful application of crude oil to burners or furnaces requires the knowledge of persons thoroughly familiar with this work.

The manufacturers who have made a specialty of this have gone to the expense of carrying on a series of tests covering a long period, from which results they have been able to design what they consider the most efficient oil burning system on the market; it being found that to obtain the greatest economy it is as essential to have a perfect pumping system as it is to have proper arrangement of furnace and a good burner.

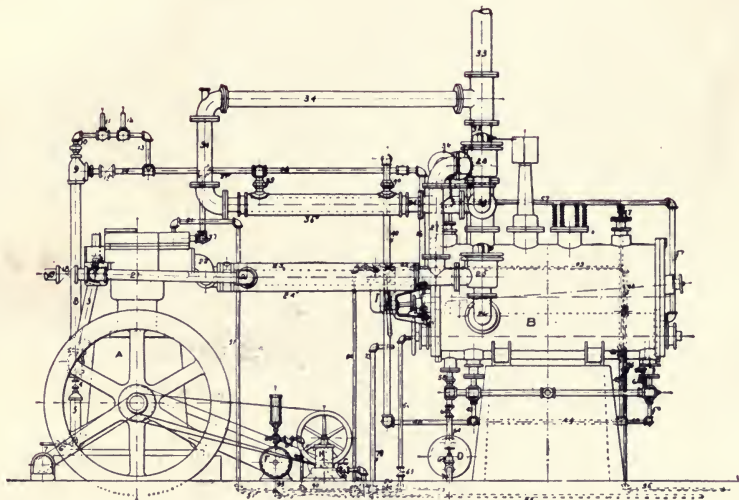
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## THE CHAS. C. MOORE & CO'S CRUDE OIL SYSTEMS FOR GAS ENGINES.



For engines whose cylinder dimensions do not exceed 15"x14" an automatic vapor system, which is guaranteed to permit of close regulation at the engine, and of uninterrupted service.



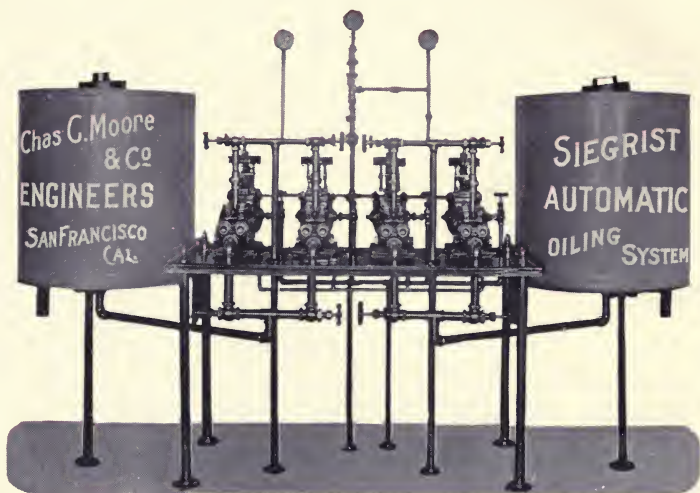
For engines with cylinder dimensions exceeding 15"x14" an automatic combination fixed oil and water gas system, embodying the utmost refinements as tending toward economy and permitting of the use of the heavy crude oils.

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## SIEGRIST AUTOMATIC OILING SYSTEM.



The Siegrist Automatic Oiling System to install and operate is extremely simple in every detail. Whether a small or a large station, it will lubricate all or a part of the machinery and make a considerable saving in oil bills.



This system is absolutely reliable in delivering oil as desired; it being perfect in construction insures accuracy; the delivery is not affected by changes of heat or cold; it does not depend on gravity but a high steam pressure, and requires the handling of the oil but once—from barrel to tank.

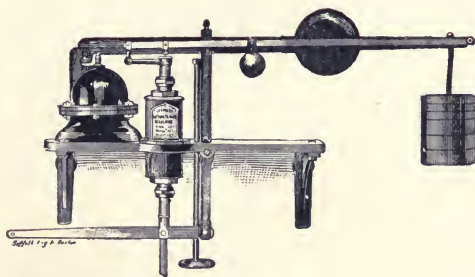
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## THE SPENCER DAMPER REGULATORS.



This regulator, unlike any regulator yet produced, has the power to move the damper or dampers in both directions by water pressure and is not of necessity wide open or shut. It will close or open wide the damper or dampers on a variation of one pound of steam. It makes a partial stroke and stands at any point.

On account of this positive power in both directions, connections to dampers by chains are dispensed with where possible, and no weights are used.



The fact is emphasized that the Spencer is the only regulator working by water pressure that makes a partial stroke and stands at any intermediate point between the open and closed position. By this statement it is meant that the Spencer will move from the open position to one-quarter, one-half, three-quarters or fractions thereof, and come to and remain indefinitely at a state of rest, and then return to the open position, thereby making the only true and proper movement of the damper.

One of these Regulators will govern from one to twenty boilers by moving as many individual dampers or one or more main damper.

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